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NATIONAL GEOGRAPHIC

**Hidden
Tribes**
of the

AMAZON

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Maya Royal City 96 **Zimbabwe Upheaval 100** **Eating Big in Pittsburgh 114**

From left to right: FourTrax Recon® ES, Honda BF225 Outboard Engine, Honda S2000, AquaTrax™ R12X, Honda Accord EX Coupe, Gold Wing®, Honda Harmony™ HRB27HXA lawnmower, Acura TSX, Honda Trimmer HHT25SLTA, Honda Super Quiet EU3000IS Generator. ©2003 American Honda Motor Co., Inc.



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THE COVER

Tepi, a Matis Indian from Brazil's Amazon, helps guide an expedition to find the Flecheiros, a tribe never contacted by outsiders.

BY NICOLAS REYNARD

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NG Television and Film



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INTO THE AMAZON

SHOULD WE CONTACT ISOLATED TRIBES? Debate the ethics. View a photo gallery and explore the first peaceful contact with the Korubo of Brazil—locals call them the head bashers.

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Sometimes it seems your seasonal allergies want to make you miserable in as many ways as they can. That's when you need the multi-symptom relief of Allegra. Allegra is specifically designed to block the histamine that triggers allergic responses like runny nose, itchy eyes and scratchy throat. Which may be one reason it's the number one prescription antihistamine. Allegra is for people 12 and older. Side effects are low and may include headache, cold or back pain. Talk to your doctor about Allegra.

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ALLEGRA[®]
(fexofenadine hydrochloride)
Capsules and Tablets

INDICATIONS AND USAGE

Seasonal Allergic Rhinitis

ALLEGRA is indicated for the relief of symptoms associated with seasonal allergic rhinitis in adults and children 6 years of age and older. Symptoms treated effectively were sneezing, rhinorrhea, itchy nose/palate/throat, itchy/watery/red eyes.

Chronic Idiopathic Urticaria

ALLEGRA is indicated for treatment of uncomplicated skin manifestations of chronic idiopathic urticaria in adults and children 6 years of age and older. It significantly reduces pruritus and the number of wheals.

CONTRAINDICATIONS

ALLEGRA is contraindicated in patients with known hypersensitivity to any of its ingredients.

PRECAUTIONS

Drug Interaction with Erythromycin and Ketoconazole

Fexofenadine hydrochloride has been shown to exhibit minimal (ca. 5%) metabolism. However, co-administration of fexofenadine hydrochloride with ketoconazole and erythromycin led to increased plasma levels of fexofenadine hydrochloride. Fexofenadine hydrochloride had no effect on the pharmacokinetics of erythromycin and ketoconazole. In two separate studies, fexofenadine hydrochloride 120 mg twice daily (two times the recommended twice daily dose) was co-administered with erythromycin 500 mg every 8 hours or ketoconazole 400 mg once daily under steady state conditions to normal, healthy volunteers (n=24, each study). No differences in adverse events of QT_c interval were observed when patients were administered fexofenadine hydrochloride alone or in combination with erythromycin or ketoconazole. The findings of these studies are summarized in the following table.

Effects on steady-state fexofenadine hydrochloride pharmacokinetics after 7 days of co-administration with fexofenadine hydrochloride 120 mg every 12 hours (two times the recommended twice daily dose) in normal volunteers (n=24)

Concomitant Drug	C _{max} (Peak plasma concentration)	AUC _{0-12h} (Extent of systemic exposure)
Erythromycin (500 mg every 8 hrs)	+82%	+107%
Ketoconazole (400 mg once daily)	+135%	+165%

The changes in plasma levels were within the range of plasma levels achieved in adequate and well-controlled clinical trials.

The mechanism of these interactions has been evaluated *in vitro*, *in situ*, and *in vivo* animal models. These studies indicate that ketoconazole or erythromycin co-administration enhances fexofenadine gastrointestinal absorption. *In vivo* animal studies also suggest that in addition to increasing absorption, ketoconazole decreases fexofenadine hydrochloride gastrointestinal secretion, while erythromycin may also decrease biliary excretion.

Drug Interactions with Antacids

Administration of 120 mg of fexofenadine hydrochloride (2 x 60 mg capsule) within 15 minutes of an aluminum and magnesium containing antacid (Maalox[®]) decreased fexofenadine AUC by 41% and C_{max} by 43%. ALLEGRA should not be taken closely in time with aluminum and magnesium containing antacids.

Carcinogenesis, Mutagenesis, Impairment of Fertility

The carcinogenic potential and reproductive toxicity of fexofenadine hydrochloride were assessed using terfenadine studies with adequate fexofenadine hydrochloride exposure (based on plasma area-under-the-concentration vs. time [AUC] values). No evidence of carcinogenicity was observed in an 18-month study in mice and in a 24-month study in rats at oral doses up to 150 mg/kg of terfenadine (which led to fexofenadine exposures that were respectively approximately 3 and 5 times the exposure from the maximum recommended daily oral dose of fexofenadine hydrochloride in adults and children).

In vitro [Bacterial Reverse Mutation, CHO/HGPRT Forward Mutation, and Rat Lymphocyte Chromosomal Aberration assays] and *in vivo* [Mouse Bone Marrow Micronucleus assay] tests, fexofenadine hydrochloride revealed no evidence of mutagenicity.

In rat fertility studies, dose-related reductions in implants and increases in postimplantation losses were observed at an oral dose of 150 mg/kg of terfenadine (which led to fexofenadine hydrochloride exposures that were approximately 3 times the exposure of the maximum recommended daily oral dose of fexofenadine hydrochloride in adults).

Pregnancy

Teratogenic Effects: Category C. There was no evidence of teratogenicity in rats or rabbits at oral doses of terfenadine up to 300 mg/kg (which led to fexofenadine exposures that were approximately 4 and 31 times, respectively, the exposure from the maximum recommended daily oral dose of fexofenadine in adults).

There are no adequate and well-controlled studies in pregnant women. Fexofenadine should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nonteratogenic Effects. Dose-related decreases in pup weight gain and survival were observed in rats exposed to an oral dose of 150 mg/kg of terfenadine (approximately 3 times the maximum recommended daily oral dose of fexofenadine hydrochloride in adults based on comparison of fexofenadine hydrochloride AUCs).

Nursing Mothers

There are no adequate and well-controlled studies in women during lactation. Because many drugs are excreted in human milk, caution should be exercised when fexofenadine hydrochloride is administered to a nursing woman.

Pediatric Use

The recommended dose in patients 6 to 11 years of age is based on a cross-study comparison of the pharmacokinetics of ALLEGRA in adults and pediatric patients and on the safety profile of fexofenadine hydrochloride in both adult and pediatric patients at doses equal to or higher than the recommended doses.

The safety of ALLEGRA tablets at a dose of 30 mg twice daily has been demonstrated in 438 pediatric patients 6 to 11 years of age in two placebo-controlled 2-week seasonal allergic rhinitis trials. The safety of ALLEGRA for the treatment of chronic idiopathic urticaria in patients 6 to 11 years of age is based on a cross-study comparison of the pharmacokinetics of ALLEGRA in adult and pediatric patients and on the safety profile of fexofenadine in both adult and pediatric patients at doses equal to or higher than the recommended dose.

The effectiveness of ALLEGRA for the treatment of seasonal allergic rhinitis in patients 6 to 11 years of age was demonstrated in one trial (n=411) in which ALLEGRA tablets 30 mg twice daily significantly reduced total symptom scores compared to placebo, along with extrapolation of demonstrated efficacy in patients ages 12 years and older, and the pharmacokinetic comparisons in adults and children. The effectiveness of ALLEGRA for the treatment of chronic idiopathic urticaria in patients 6 to 11 years of age is based on an extrapolation of the demonstrated efficacy of ALLEGRA in adults with this condition and the likelihood that the disease course, pathophysiology and the drug's effect are substantially similar in children to that of adult patients.

The safety and effectiveness of ALLEGRA in pediatric patients under 6 years of age have not been established.

Geriatric Use

Clinical studies of ALLEGRA tablets and capsules did not include sufficient numbers of subjects aged 65 years and over to determine whether this population responds differently from younger patients. Other reported clinical experience has not identified differences in responses between the geriatric and younger patients. This drug is known to be substantially excreted by the kidney, and the risk of toxic reactions to this drug may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection, and may be useful to monitor renal function. (See CLINICAL PHARMACOLOGY).

ADVERSE REACTIONS

Seasonal Allergic Rhinitis

Adults. In placebo-controlled seasonal allergic rhinitis clinical trials in patients 12 years of age and older, which included 2461 patients receiving fexofenadine hydrochloride capsules at doses of 20 mg to 240 mg twice daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. All adverse events that were reported by greater than 1% of patients who received the recommended twice daily dose of fexofenadine hydrochloride (60 mg capsules twice daily), and that were more common with fexofenadine hydrochloride than placebo, are listed in Table 1.

In a placebo-controlled clinical study in the United States, which included 570 patients aged 12 years and older receiving fexofenadine hydrochloride tablets at doses of 120 or 180 mg once daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. Table 1 also lists adverse experiences that were reported by greater than 2% of patients treated with fexofenadine hydrochloride tablets at doses of 180 mg once daily and that were more common with fexofenadine hydrochloride than placebo.

The incidence of adverse events, including drowsiness, was not dose-related and was similar across subgroups defined by age, gender, and race.

Table 1
Adverse experiences in patients ages 12 years and older reported in placebo-controlled seasonal allergic rhinitis clinical trials in the United States
Twice daily dosing with fexofenadine capsules at rates of greater than 1%

Adverse experience	Fexofenadine 60 mg Twice Daily (n=679)	Placebo Twice Daily (n=671)
Viral infection (cold, flu)	2.5%	1.5%
Nausea	1.6%	1.5%
Dyspepsia/heartburn	1.5%	0.3%
Drowsiness	1.3%	0.9%
Dyspepsia	1.3%	0.6%
Fatigue	1.3%	0.9%

Once daily dosing with fexofenadine hydrochloride tablets at rates of greater than 2%

Adverse experience	Fexofenadine 180 mg once daily (n=283)	Placebo (n=293)
Headache	10.6%	7.5%
Upper Respiratory Tract Infection	3.2%	3.1%
Back Pain	2.8%	1.4%

The frequency and magnitude of laboratory abnormalities were similar in fexofenadine hydrochloride and placebo-treated patients.

Pediatric. Table 2 lists adverse experiences in patients aged 6 to 11 years of age which were reported by greater than 2% of patients treated with fexofenadine hydrochloride tablets at a dose of 30 mg twice daily in placebo-controlled seasonal allergic rhinitis studies in the United States and Canada that were more common with fexofenadine hydrochloride than placebo.

Table 2
Adverse experiences reported in placebo-controlled seasonal allergic rhinitis studies in pediatric patients ages 6 to 11 in the United States and Canada at rates of greater than 2%

Adverse experience	Fexofenadine 30 mg twice daily (n=208)	Placebo (n=229)
Headache	7.2%	6.6%
Accidental injury	2.9%	1.3%
Coughing	3.8%	1.3%
Fever	2.4%	0.9%
Pain	2.4%	0.4%
Otitis Media	2.4%	0.0%
Upper Respiratory Tract Infection	4.3%	1.7%

Chronic Idiopathic Urticaria

Adverse events reported by patients 12 years of age and older in placebo-controlled chronic idiopathic urticaria studies were similar to those reported in placebo-controlled seasonal allergic rhinitis studies. In placebo-controlled chronic idiopathic urticaria clinical trials, which included 726 patients 12 years of age and older receiving fexofenadine hydrochloride tablets at doses of 20 to 240 mg twice daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. Table 3 lists adverse experiences in patients aged 12 years and older which were reported by greater than 2% of patients treated with fexofenadine hydrochloride 60 mg tablets twice daily in controlled clinical studies in the United States and Canada and that were more common with fexofenadine hydrochloride than placebo. The safety of fexofenadine hydrochloride in the treatment of chronic idiopathic urticaria in pediatric patients 6 to 11 years of age is based on the safety profile of fexofenadine hydrochloride in adults and adolescent patients at doses equal to or higher than the recommended dose (see Pediatric Use).

Table 3
Adverse experiences reported in patients 12 years and older in placebo-controlled chronic idiopathic urticaria studies in the United States and Canada at rates of greater than 2%

Adverse experience	Fexofenadine 60 mg twice daily (n=186)	Placebo (n=178)
Back Pain	2.2%	1.1%
Sinusitis	2.2%	1.1%
Dizziness	2.2%	0.6%
Drowsiness	2.2%	0.6%

Events that have been reported during controlled clinical trials involving seasonal allergic rhinitis and chronic idiopathic urticaria patients with incidences less than 1% and similar to placebo and have been rarely reported during postmarketing surveillance include: insomnia, nervousness, and sleep disorders or parasomnias. In rare cases, rash, urticaria, pruritus and hypersensitivity reactions with manifestations such as angioedema, chest tightness, dyspnea, flushing and systemic anaphylaxis have been reported.

OVERDOSAGE

Reports of fexofenadine hydrochloride overdose have been infrequent and contain limited information. However, dizziness, drowsiness, and dry mouth have been reported. Single doses of fexofenadine hydrochloride up to 900 mg (six normal volunteers at this dose level), and doses up to 600 mg twice daily for 1 month (three normal volunteers at this dose level) or 240 mg once daily for 1 year (234 normal volunteers at this dose level) were administered without the development of clinically significant adverse events as compared to placebo.

In the event of overdose, consider standard measures to remove any unabsorbed drug. Symptomatic and supportive treatment is recommended.

Hemodialysis did not effectively remove fexofenadine hydrochloride from blood (1.7% removed) following terfenadine administration.

No deaths occurred at oral doses of fexofenadine hydrochloride up to 3000 mg/kg in mice (110 times the maximum recommended daily oral dose in adults and 200 times the maximum recommended daily oral dose in children based on mg/m²) and up to 5000 mg/kg in rats (230 times the maximum recommended daily oral dose in adults and 400 times the maximum recommended daily oral dose in children based on mg/m²). Additionally, no clinical signs of toxicity or gross pathological findings were observed. In dogs, no evidence of toxicity was observed at oral doses up to 2000 mg/kg (300 times the maximum recommended daily oral dose in adults and 530 times the maximum recommended daily oral dose in children based on mg/m²).

DOSAGE AND ADMINISTRATION

Seasonal Allergic Rhinitis

Adults and Children 12 Years and Older. The recommended dose of ALLEGRA is 60 mg twice daily, or 180 mg once daily. A dose of 60 mg once daily is recommended as the starting dose in patients with decreased renal function (see CLINICAL PHARMACOLOGY).

Children 6 to 11 Years. The recommended dose of ALLEGRA is 30 mg twice daily. A dose of 30 mg once daily is recommended as the starting dose in pediatric patients with decreased renal function (see CLINICAL PHARMACOLOGY).

Chronic Idiopathic Urticaria

Adults and Children 12 Years and Older. The recommended dose of ALLEGRA is 60 mg twice daily. A dose of 60 mg once daily is recommended as the starting dose in patients with decreased renal function (see CLINICAL PHARMACOLOGY).

Children 6 to 11 Years. The recommended dose of ALLEGRA is 30 mg twice daily. A dose of 30 mg once daily is recommended as the starting dose in pediatric patients with decreased renal function (see CLINICAL PHARMACOLOGY).

Please see product circular for full prescribing information.

Rx only

Brief Summary of Prescribing Information as of January 2003

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From the Editor



NICOLAS REYNARD

Getting the picture has long been a mission of NATIONAL GEOGRAPHIC. Yet there are times when our desire to peer into the remotest corners of the world must be stifled—or so argues Sydney Possuelo, a man on a mission of his own.

Working deep in the Amazon, Possuelo (above, at center) is a *sertanista*, a uniquely Brazilian occupation that's equal parts Indian rights activist, government bureaucrat, ethnographer, and wilderness tracker. Earning his spurs in the 1970s by establishing the first contact between some of Brazil's most isolated Indian tribes and the outside world, Possuelo believed he was improving the lives of indigenous peoples. But after witnessing how alcohol, logging, and non-native cultures ravaged Indian communities, Possuelo had an epiphany: The only way to save uncontacted peoples was to seal off their territory from outsiders. The story of his effort to protect a tribe known as the *Flecheiros* begins on page 2.

Possuelo's critics have accused him of playing God. Why, they argue, should isolated tribes die from malaria when modern medicine has a cure? Yet through a different lens, Possuelo can be seen as a man with an abiding faith in the wisdom of people who are all but invisible to us. While the journalist in me cringes at the idea of averting our gaze from anything, there may be times when the only right thing to do is to set aside our cameras—and our curiosity—and take no pictures at all.

Bill Allen

■ Watch my preview of the September issue on **National Geographic Today** on August 17 at 7 p.m. and again at 10 p.m. (ET and PT) on the National Geographic Channel.

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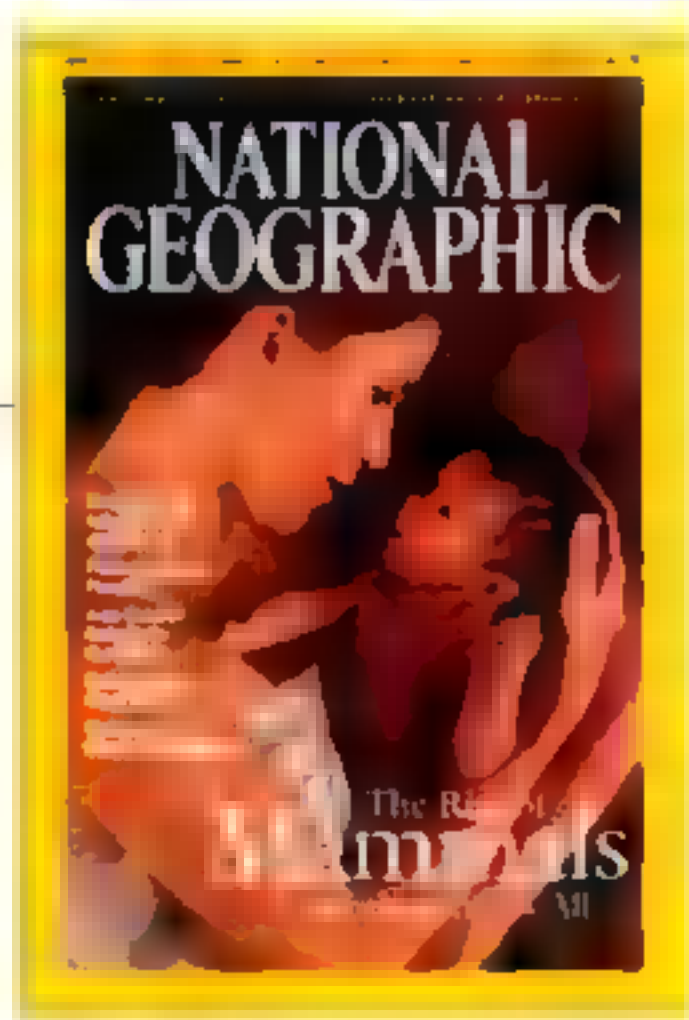


Make every mile count.

Forum

April 2003

The cover story on mammals inspired the most letters this month—about a quarter of them devoted to Robert Clark's cover shot of new mother Julie Marques and her daughter, Amelia. "It beautifully captures the bond between mother and child," wrote one mother. But critics of evolution took strong exception to the article. Wrote one: "For the record, my ancestral mother was named Eve."



The Rise of Mammals

The mother-and-child picture on the cover is a masterpiece. How anyone can look at that darling child that only nine months before was a pinhead-size egg and think this magical development was only a blind accident of chance is beyond me.

RALPH SICKLES
Tempe, Arizona

When I open up most magazines, I expect to see nothing but photos of perfectly sculpted models with flawless complexions. From NATIONAL GEOGRAPHIC, however, I expect something a little closer to reality. The woman pictured on the opening pages of this article looks like a supermodel who just happens to be pregnant. If you are going to have a picture of a nude pregnant woman, why don't you show one who looks like the other 99 percent of us—stretch marks, cellulite, water retention, and all. Don't women

have enough perfection to compare themselves to already?

ELISABETH D. BEUTLER
Phoenix, Arizona

The caption on page 21 states that Asian mammals crossed the Bering Strait land bridge to North America during a period of intense global warming. But I thought the land bridge formed during periods of global cooling, which allowed for the formation of glaciers that locked up water, lowered ocean levels, and exposed the bridge. It's counterintuitive that a land bridge would form with higher ocean levels.

BRUCE KLEIN
Redmond, Washington

What you describe is correct for recent times, but 50 million years ago conditions were different. Sea level was not affected by melting ice but by continental drift and mountain building. The land bridge was exposed despite the warmth of the early Eocene.

What's New at Gombe

I have just left Gombe National Park to write my Ph.D. dissertation after six and a half years studying the chimpanzees there. It is my opinion that the immediate threat to the chimps

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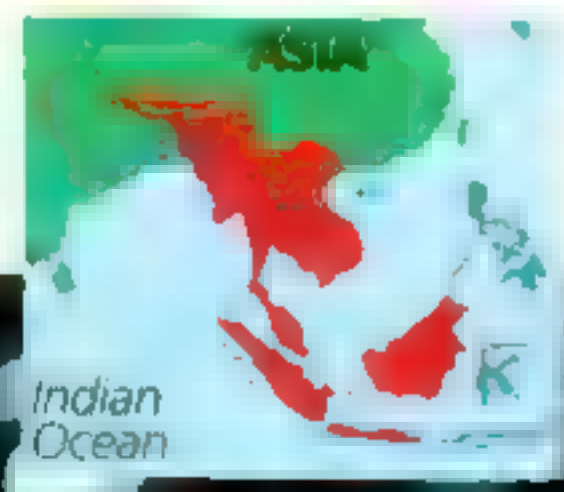
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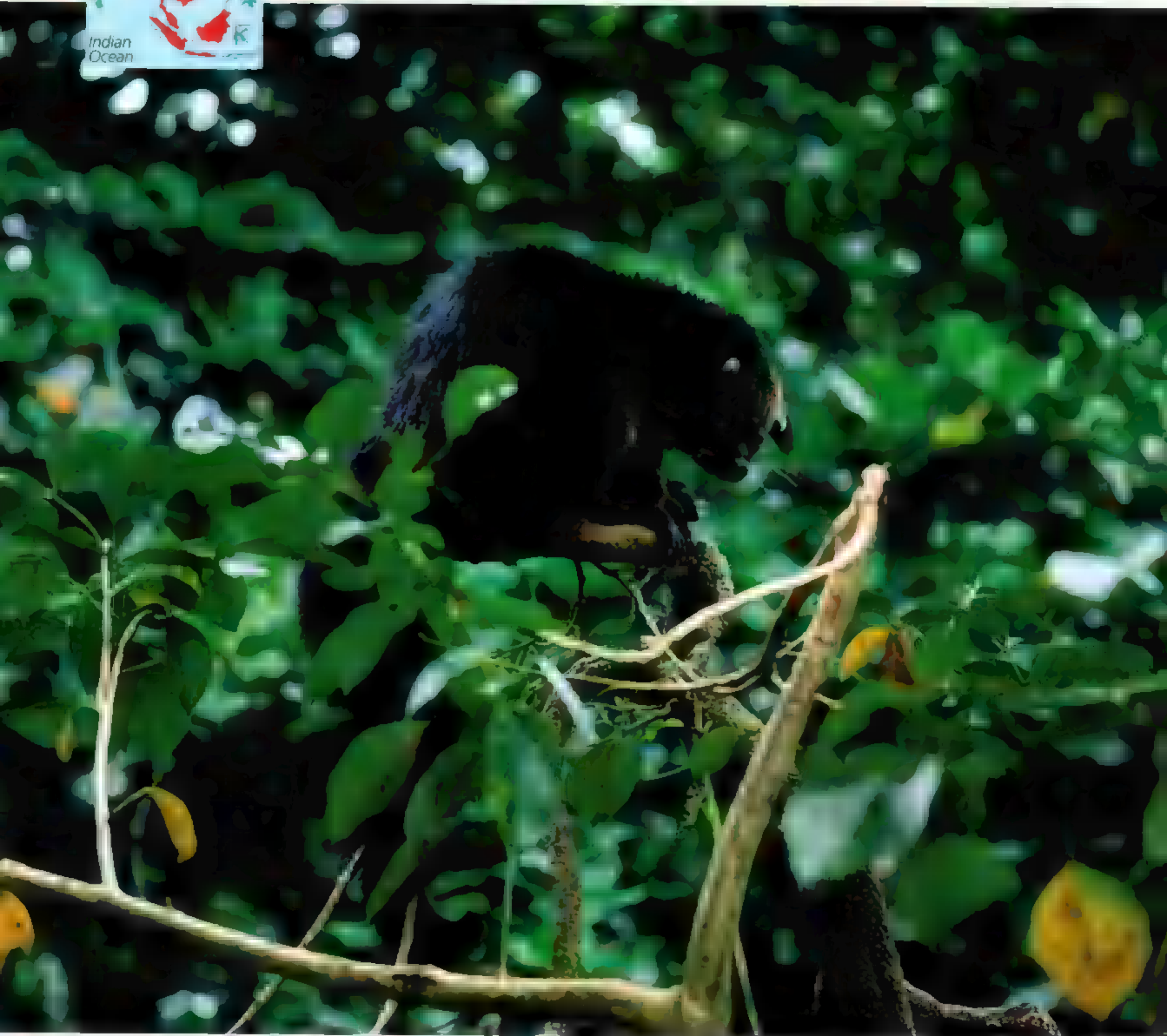


Binturong (*Arctictis binturong*)

Size: Head and body length, 61-96 cm; tail, 56-89 cm **Weight:** 9-14 kg

Habitat: Rainforests of Southeast Asia, including Malaysia, Indonesia and Palawan Island

Surviving number: Unknown; populations declining



Photographed by Gerald Lubitt

WILDLIFE AS CANON SEES IT

Heads or tails? For the binturong it hardly matters which end is up. Prehensile at the tip, its long and muscular tail not only grips branches but also serves the civet as a brake when running down trees and as a prop when standing on its hind legs. Awkward on land, these consummate climbers spend most of their nocturnal waking hours combing the rainforest canopy for food. Fruit dominates their diet, but they adroitly prey on

small animals as well; to bag a duck, for instance, they leap nearly two meters in the air and land squarely on it. Agile though they are, binturongs cannot evade the dangers posed by habitat loss and hunting.

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Chiru Poaching in Tibet's Chang Tang

I'm curious as to why the chiru are killed to get their wool. Why not capture and domesticate some so the wool could be shorn like sheep or alpaca?

GREGG ESHELMAN

Weiser, Idaho

China is reportedly investigating this possibility. However, such a venture will likely prove unprofitable, says George Schaller, author of our story. "Better to spend the money on protection and management."

It's impossible to enforce laws protecting the chiru in the reserves because the terrain is too rugged, and conservation officers often lack staff, equipment, and funding. The only



GALEY HOWELL

way to stop poaching and fur trading is to change opinions of the people who buy products made from chiru wool. Once consumers understand the true price—that tens of thousands of these lovely animals have to be killed—the future of the Tibetan chiru can be promising.

ZHANG YANG

Christchurch, New Zealand

As a Kashmiri from the Indian side, I have seen scores of women working the chiru wool on their spinning wheels. It was their livelihood, and I

don't know what they will do now for a living. However, the whole issue was turned into a populist gambit by the government of Farooq Abdullah, the former chief minister of Jammu and Kashmir. The local newspapers also portrayed it as yet another method of "Indian aggression" aimed at destroying the livelihood of Kashmiris. But the government should have informed people associated with the trade about the pressing need to save chiru from extinction.

MURTAZA SHIBLI

London, England

THERE'S SOMETHING ABOUT THIS ELEGANT
AUTOMOBILE THAT MIGHT SURPRISE YOU.



of Gombe is disease. Since I started research in 1996, the chimpanzees experienced at least four serious outbreaks. Three of these were respiratory in nature, and the ease with which they spread led us to conclude that the source must have been a human one. Possible human vectors include tourists, local villagers, and researchers. Without Jane Goodall the chimpanzees and the forest that is Gombe would no longer exist. Yet research and tourism, despite their protective role, have

WRITE TO FORUM

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introduced other threats. Great apes are simply unsuited to conservation strategies that place them in proximity to humans.

ELIZABETH GREENGRASS
Hellevoetshuis, Netherlands

Whenever I see a picture of Jane Goodall—skin wrinkled from endless hours outdoors, eyes alight with warmth and keen intelligence, and silvery hair pulled back into a no-nonsense ponytail—I feel like sending copies of the photo to all of those expensive, high-toned cosmetic companies, along with notes saying: “Hey, guys—this is what real beauty looks like! Quit spending your massive resources on artifice, and start channeling it into things that really matter!”

JOANN M. DAVIS
Albuquerque, New Mexico

On pages 88-9 you depict chimps termite fishing. Two years ago while traveling in Africa, I found myself in a tent beside a huge termite mound. Having tasted ants as a biology graduate student, I was curious to learn how termites tasted. The chimps seemed to enjoy them. I dutifully selected what I thought was a proper twig and then spent the next hour fishing. Not having been taught by my mother like the chimps are, my catch was absolutely zero. Imagine how utterly stupid I felt in front of the amused local people when I, a Ph.D., couldn't accomplish what the chimps did so easily.

E. M. STURTEVANT
Sarasota, Florida

Zip: Augusta, Georgia

Women who served our country in Iraq were in danger of being



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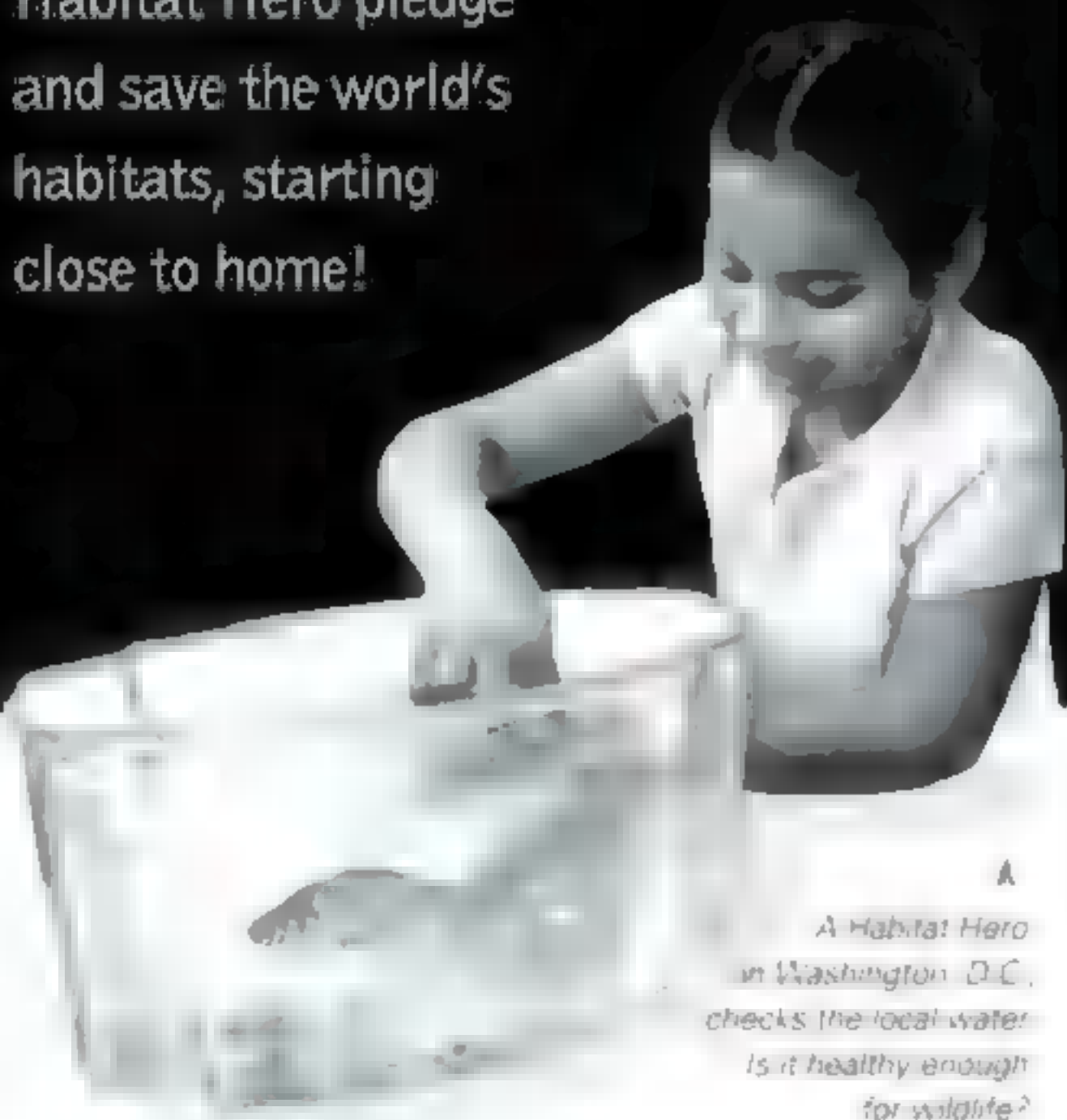
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Conservationist Mike Fay trekked 2,000 miles across Africa—and helped preserve 10,000 square miles of vital habitat! But you don't have to go that far to be a Habitat Hero! Every action counts, large or small. Recycle. Organize a river cleanup. Take the Habitat Hero pledge and save the world's habitats, starting close to home!



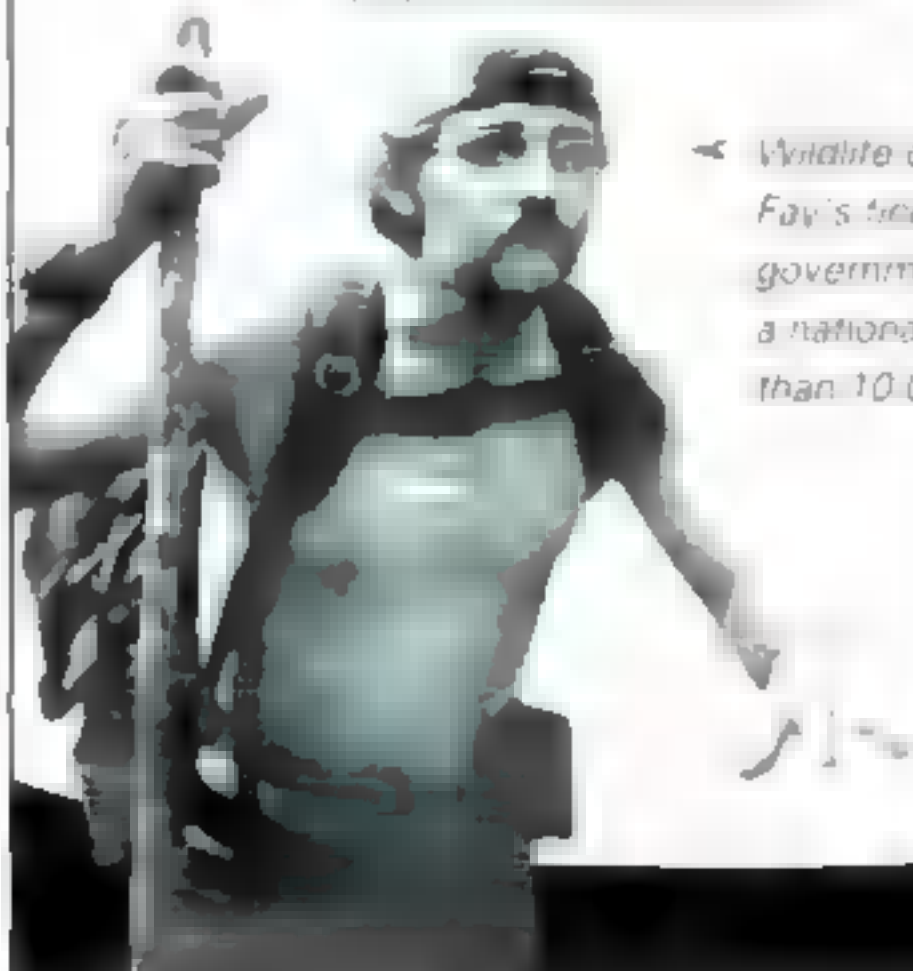
A Habitat Hero in Washington, D.C., checks the local water. Is it healthy enough for wildlife?

GEOGRAPHY ACTION! 2003 Habitats: Home Sweet Home

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NATIONAL GEOGRAPHIC

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Wildlife conservationist Mike Fay's findings helped inspire the government of Gabon to create a national park system of more than 10,000 square miles.

killed and taken prisoner. Upon their return, they are not welcome as members at Augusta National Golf Club. Shame on Augusta, and on every professional golfer who would consider playing at such a place. True freedom means different things to different people, but it should definitely include the end to all types of discrimination.

GREGORY TIKKA
Kenai, Alaska

I expect balanced reporting and fairness in your magazine, but this article just rehashed what has been in the media while ignoring the facts. Club chairman Hootie Johnson's bank loaned money to African-American businessmen when other banks would not. He campaigned for black political candidates when it was not very popular. The University of South Carolina's women's golf team was his guest at Augusta, and he let them use the champions' locker room.

JEFF BRITT
Tucson, Arizona

Caves of Oman

Living in the Sultanate of Oman for two years gave me the opportunity to experience the awesome grandeur of the Eastern Hajar range. The sultanate remains relatively undeveloped for tourists, but it is a country well worth visiting. However, the region's stark beauty could so easily be adversely affected if unsympathetic development takes place in the bid to put Oman on the tourist map. The prospect of cable railways and lookouts is not one I would favor. I would certainly encourage some further development for tourists' comfort and convenience, but care is needed.

BRIAN SMAILES
Ewelme, England

I am an Omani living in the United States. I was so proud to see my country featured in NATIONAL GEOGRAPHIC. You did a pretty accurate job of capturing Oman and its beauty. I was amused to see on your website that the author listed the emptiness of Oman as one of the worst parts of his trip there. It reminded me of the time my husband almost ran us off the road when I commented on how exotic his native Iowa was.

FADYA ALBAKRY
Austin, Texas

Corsica

An independent Corsica? No way! It's clear from your article that Corsican separatists are terrorists and mafia who don't speak for the majority of the population. French mainlanders in Corsica don't walk around with bullwhips forcing shackled Corsicans to toil for them. The use of troops to put down a rebellion in the 1970s was nothing but the restoration of law and order. France's provinces are diverse enough to use some decentralization, but not independence.

DMITRIY TARASOV

Richmond, Virginia

FROM OUR ONLINE FORUM

nationalgeographic.com/ngm/0304

On pages 58-9 you depict what you describe as a Greek Orthodox Holy Week procession in the village of Cargèse. The churchgoers on those pages are not Orthodox at all. They are Eastern Rite Catholics who follow the Byzantine, or Greek, Rite of the Catholic Church. This explains why Monsignor Fiorenzo Marchiano can tend to both flocks and explains his statement that "when I am with Greeks, I am Greek. When I am with Romans, I am Roman." He is speaking of the two rites of the Catholic Church followed by Corsicans: the Greek Rite and the Latin Rite.

JAN LOKUTA

Milford, Pennsylvania

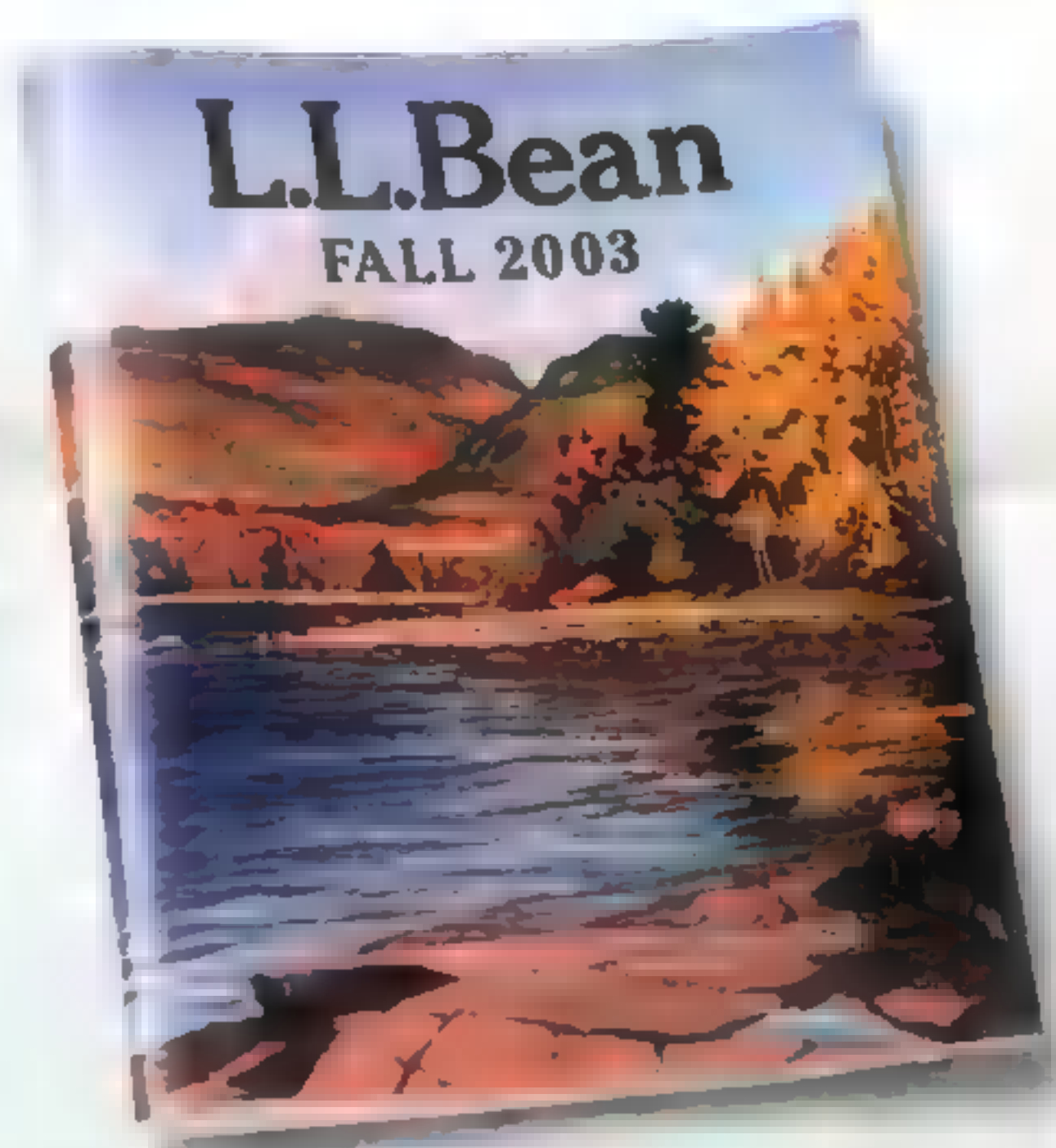
Geographica: Sudan's "Lost Boys"

My family has been blessed by the addition of two Dinka boys, officially aged 17, who have lived with us as foster children for almost two years now. When they got off the plane from Kenya, our world was completely foreign to them. They faced this new challenge with dignity and humor, and a zest for life we could only admire. We have come to know many of these "lost boys" and marvel at their acceptance of this new life. Their story is tragic, their past a nightmare—but their futures are bright and filled with hope. What a glorious thing for this family to be a part of.

LARRY HEWITT

Centralia, Washington

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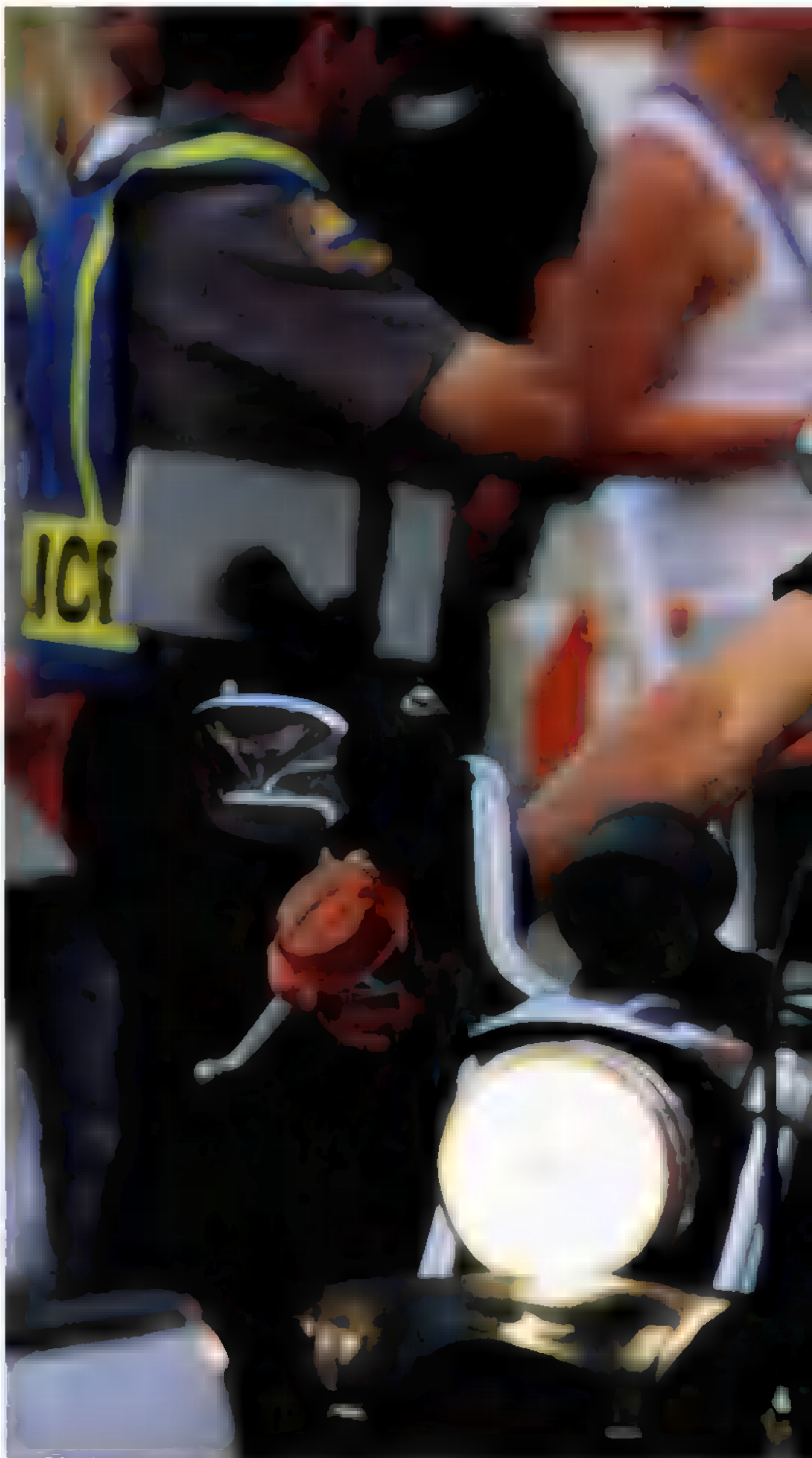
Harley's Midlife Crisis

As its riders age, are sales figures born to be mild?

Harley-Davidson turns a hundred years old this month, and business is vrooming. Some 264,000 of its heavyweight "hogs" were shipped to dealers last year. But there's a bump in the road ahead: Harley's best customers are now middle-aged men—baby boomers born between 1946 and 1964—and that doesn't bode well for future sales.

The median age of American motorcycle buyers was 32 in 1990; in 1998 it was 38. Harley's typical buyer in 2001 was even older at 46. Boomers' love for the brand makes sense. Harley's reputation as the tough-guy's bike of choice blossomed when boomers were young and impressionable. Plus, many riders can't afford the motorcycles, which can cost around \$20,000, until middle age. The company's decision to market its leather-jacket image to white-collar workers helped bring it back from the brink of bankruptcy in the mid-80s.

Yet the same demographic that saved the legendary motorcycle company will cause it trouble in a decade or two. By then, boomers may be getting too old to buy motorcycles. The smaller, post-boom generation that arrived as



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birthrates declined in the 1960s probably won't supply enough potential consumers to step into boomers' motorcycle boots. And they're unlikely to feel particularly nostalgic for Harley's *Easy Rider* image and trademark engine roar.

Today bikers in their 20s prefer to ride something flashier and cheaper. So Harley is retooling its appeal with sportier-style cycles (like the V-Rod, below) and less expensive models. And it's going after a new



SISSE BROMBERG

demographic: women. The company's female buyers have already increased from 2 percent in 1987 to 9 percent in 2001. Since 1999 some 40 percent of the more than 16,000 people who have taken the riding lessons offered at many dealerships are women.

Of course, the aging baby boom won't be a bust for every industry. Demographer Cheryl Russell predicts that boomers who backpacked around the world in their youth will have time and money to set out again—this time in a bit more style. So travel businesses should prosper in the future. Another winner, already on the rise, is in the alcoholic beverage category. "Every generation has its own association with alcohol," Russell explains. "The World War II group drank hard liquor. Baby boomers will be drinking a lot more wine."

—Margaret G. Zackowitz

Getting Old Is a Pain

By 2025 the 78 million members of the baby-boom generation will range from 61 to 79 years old and represent 25 percent of adults in the U.S. Boomers can be expected to have more health care needs as they age, but not necessarily for the same set of ailments that plagued their parents. Doctors are already seeing an increase in sports injuries among the middle-aged. Emergency rooms admitted one-third more injured boomers in 1998 than they did in 1991; bicycling and basketball most often put them there. But midlife jocks shouldn't bench themselves. Exercising into old age is commendable, say doctors—just stretch first.

WEBSITE EXCLUSIVE

Find links and resources selected by our Research Division at nationalgeographic.com/ngm/resources/0308.

CONSERVATION

Great Apes in Great Peril

Central Africa has been a relatively safe haven for gorillas and chimpanzees, compared to East and West Africa, where their habitat has been overrun by human expansion. But now thousands of apes in the western part of this region are dying from one of the world's most dreaded diseases: ebola.

A series of ebola outbreaks in humans occurred in Gabon and the Democratic Republic of the Congo in the 1990s. The virus may have spread from infected primates to hunters killing apes for food or the bush-meat trade. More recently researchers found apes apparently felled by ebola



NGS PHOTOGRAPHER MICHAEL NICHOLS

in Gabon's Minkébé forest region. "I'd guess thousands and perhaps tens of thousands of gorillas died there," says William B. Karesh of the Wildlife Conservation Society.

Now ebola is striking in the Congo, where the Lossi Gorilla

Sanctuary has lost about half of its gorilla population. By the time you read this, Odzala National Park (above), which has one of the world's highest known densities of gorillas, may have become ebola's next target. —John L. Eliot

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“I’ve got my routine down: I stay active, and try my best to eat healthier meals. To help me stay on track, my doctor added *Avandia*. ■ makes my body more responsive to its own natural insulin, so I can control my blood sugar more effectively.

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Avandia, along with diet and exercise, helps improve blood sugar control. It may be prescribed alone, with metformin, sulfonylureas, or insulin. When taking *Avandia* with sulfonylureas or insulin, patients may be at increased risk for low blood sugar. Ask your doctor whether you need to lower your sulfonylurea or insulin dose.

Some people may experience tiredness, weight gain or swelling with *Avandia*.

Avandia may cause fluid retention or swelling which could lead to or worsen heart failure, so you should tell your doctor if you have a history of these conditions. If you experience an unusually rapid increase ■ weight, swelling or shortness of breath while taking *Avandia*, talk to your doctor immediately. In combination with insulin *Avandia* may increase the risk of other heart problems. Ask your doctor about important symptoms and if the combination continues to work for you. *Avandia* is not for everyone. *Avandia* is not recommended for patients with severe heart failure or active liver disease.

Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking *Avandia*.

If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking *Avandia*.

See important patient information on the adjacent page.

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What is Avandia?

Avandia is one product in a class of prescription drugs called thiazolidinediones (thigh-a-zol-a-deen-die-owns) or TZDs. It is used to treat type 2 diabetes by helping the body use the insulin that it is already making. *Avandia* comes as pills that can be taken either once a day or twice a day to help improve blood sugar levels.

How does Avandia treat type 2 diabetes?

If you have type 2 diabetes, your body probably still produces insulin but it is not able to use the insulin efficiently. Insulin is needed to allow sugar to be carried from the bloodstream into many cells of the body for energy. If insulin is not being used correctly, sugar does not enter the cells very well and builds up in the blood. If not controlled, the high blood sugar level can lead to serious medical problems, including kidney damage, blindness and amputation.

Avandia helps your body use insulin by making the cells more sensitive to insulin so that the sugar can enter the cell.

How quickly will Avandia begin to work?

Avandia begins to reduce blood sugar levels within 2 weeks. However, since *Avandia* works to address an important underlying cause of type 2 diabetes, insulin resistance, it may take 8 to 12 weeks to see the full effect. If you do not respond adequately to your starting dose of *Avandia*, your physician may increase your daily dose to improve your blood sugar control.

How should I take Avandia?

Your doctor may tell you to take *Avandia* once a day or twice a day (in the morning and evening). It can be taken with or without meals. Food does not affect how *Avandia* works. To help you remember to take *Avandia*, you may want to take it at the same time every day.

What if I miss a dose?

If your doctor has prescribed Avandia for use once a day:

- As soon as you remember your missed dose, take one tablet anytime during the day.
- If you forget and go a whole day without taking a dose, don't try to make it up by adding another dose on the following day. Forget about the missed dose and simply follow your normal schedule.

If your doctor has prescribed Avandia for use twice a day:

- As soon as you remember the missed dose, take one tablet.
- Take the next dose at the normal time on the same day.
- Don't try to make up a missed dose from the day before.
- You should never take three doses on any single day in order to make up for a missed dose the day before.

Do I need to test my blood for sugar while using Avandia?

Yes, you should follow your doctor's instructions about your at-home testing schedule.

Does Avandia cure type 2 diabetes?

Currently there is no cure for diabetes. The only way to reduce the effects of the disease is to maintain good blood sugar control by following your doctor's advice for diet, exercise, weight control, and medication. *Avandia*, alone or in combination with other antidiabetic drugs (i.e., sulfonylureas, metformin, or insulin), may improve these other efforts by helping your body make better use of the insulin it already produces.

Can I take Avandia with other medications?

Avandia has been taken safely by people using other medications, including other antidiabetic medications,

birth control pills, warfarin (a blood thinner), Zantac® (ranitidine, an antiulcer product from GlaxoSmithKline), certain heart medications, and some cholesterol-lowering products. You should discuss with your doctor the most appropriate plan for you. If you are taking prescription or over-the-counter products for your diabetes or for conditions other than diabetes, be sure to tell your doctor. Sometimes a patient who is taking two antidiabetic medications each day can become irritable, light-headed or excessively tired. Tell your doctor if this occurs; your blood sugar levels may be dropping too low, and the dose of your medication may need to be reduced.

What are the possible side effects of Avandia?

Avandia was generally well tolerated in clinical trials. The most common side effects reported by people taking *Avandia* were upper respiratory infection (cold-like symptoms) and headache. When taking *Avandia* with sulfonylureas or insulin, patients may be at increased risk for low blood sugar. Ask your doctor whether you need to lower your sulfonylurea or insulin dose.

Some people may experience tiredness, weight gain, or swelling with *Avandia*.

Avandia may cause fluid retention or swelling which could lead to or worsen heart failure, so you should tell your doctor if you have a history of these conditions. If you experience an unusually rapid increase in weight, swelling or shortness of breath while taking *Avandia*, talk to your doctor immediately. In combination with insulin, *Avandia* may increase the risk of other heart problems. Ask your doctor about important symptoms and if the combination continues to work for you. *Avandia* is not for everyone. *Avandia* is not recommended for patients with severe heart failure or active liver disease.

Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking *Avandia*.

If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking *Avandia*, as *Avandia* may increase your chance of becoming pregnant.

Who should not use Avandia?

You should not take *Avandia* if you are in the later stages of heart failure or if you have active liver disease. The following people should also not take *Avandia*: People with type 1 diabetes, people who experienced yellowing of the skin with Rezulin® (troglitazone, Parke-Davis), people who are allergic to *Avandia* or any of its components and people with diabetic ketoacidosis.

Why are laboratory tests recommended?

Your doctor may conduct blood tests to measure your blood sugar control. Blood tests to check for serious liver problems should be conducted before starting *Avandia*, every 2 months during the first year, and periodically thereafter.

It is important that you call your doctor immediately if you experience unexplained symptoms of nausea, vomiting, stomach pain, tiredness, anorexia, dark urine, or yellowing of the skin.

How should I store Avandia?

Avandia should be stored at room temperature in a childproof container out of the reach of children. Store *Avandia* in its original container.



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Hosted by Kiefer Sutherland

DOCTORS WITHOUT BORDERS

LIFE IN THE FIELD

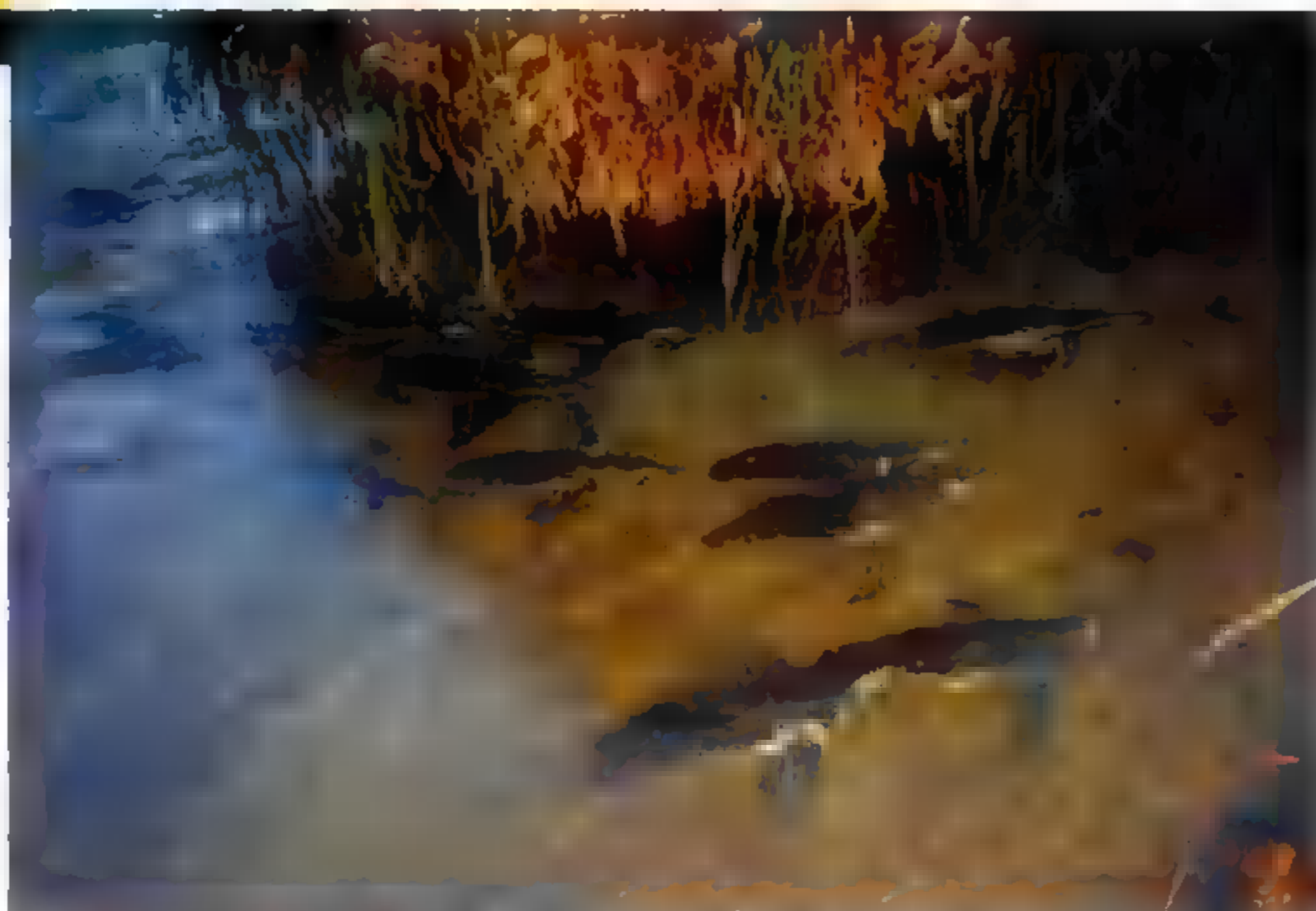
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JAMES SHAW/BLACK STAR

ANIMAL BEHAVIOR

The Migration to Nowhere

In a few months all eyes will be on the San Francisco Zoo's Magellanic penguins: Will they repeat last winter's bizarre Christmas-to-Valentine's Day performance? Back then six penguins arrived from Ohio's Six Flags and within two hours abruptly led the zoo's 46 usually languid penguins on a seven-week swim around their pool.

Why the flurry of activity? In

their native South America, Magellanics migrate twice a year some 2,000 miles along the coast in search of food. They then haul out and lay eggs, which is what the zoo birds did after their big swim. "The move to California was timed to coincide with the penguins' normal migration, so their internal clocks were telling them: Swim!" says Magellanic expert Dee Boersma of the University of Washington. "Whatever one penguin does, the rest follow."

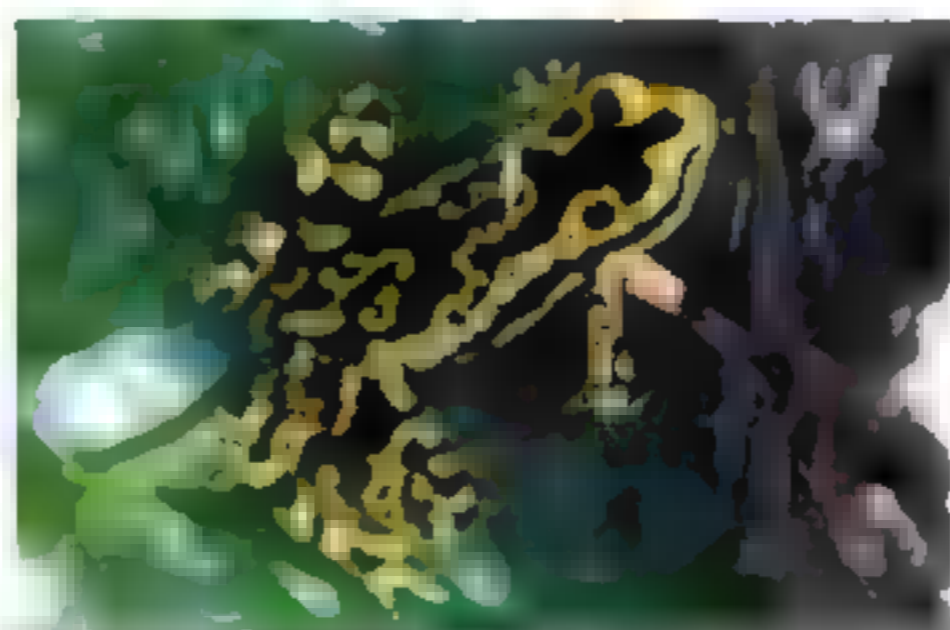
Perhaps this December the captive penguins will sit back and relax, having realized they've got nowhere to go.

—Jennifer Steinberg Holland

AMPHIBIANS

This Frog Didn't Croak

Imagine losing a family heirloom, only to find it in the backyard 20 years after you'd written it off. That's how investigators felt when they rediscovered the Rancho Grande harlequin frog. Described in 1856, the frogs were so common in Venezuela's Henri Pittier National Park that biologists collected hundreds at a time. Then they seemed to vanish. Not seen since 1982, they were feared extinct. But earlier this year an expedition found 16 frogs in a mountain stream in the park. Why the absence? It



ERNEST OFFENVADELZ

turns out the frogs had never disappeared entirely, but drought and pollution may have reduced their numbers. "Few people travel to remote areas of the park," says Thomas Ryan of the Friends of Henri Pittier National Park Scientific Society. "That's where the species may be making its last stand."

—John L. Eliot

EATS

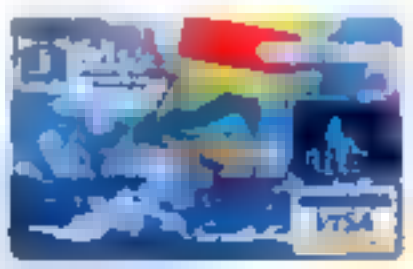
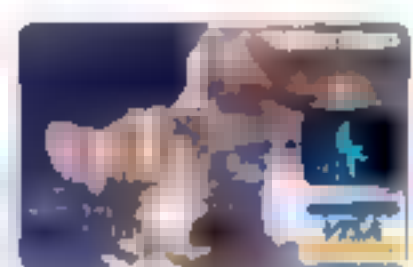
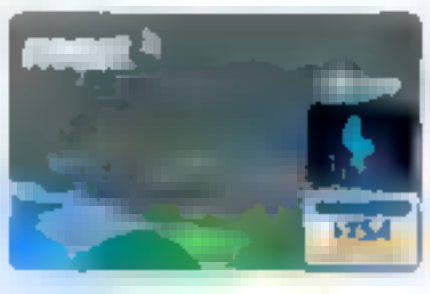


Enter the Dragon Fruit

One of the latest foods to satisfy the United States' appetite for the exotic, the dragon fruit is produced by a cactus that can draw moisture from the air like an orchid. Its smooth scales—inspiration for the fanciful name—conceal a succulent, mildly sweet flesh reminiscent of a honeydew melon with a speckling of tiny, crunchy seeds. The biggest specimens plump up to almost three pounds. Native to Central and South America, where it's called *pitaya* or *pitahaya*, the fruit traveled to Southeast Asia with the French more than a century ago.

Recently U.S. manufacturers of bottled juices began importing a frozen puree of the fruit to use as a flavoring. But concerns about fruit-fly infestations keep the fruit itself from being imported. So, with savvy consumers and trendy chefs willing to pay up to ten dollars for just one piece of fruit, boutique farmers and backyard gardeners in the U.S. are planting as fast as they can. "A lot of growers thrive on consumers' bizarre tastes," says Erik Tietig, whose Pine Island Nursery in Florida offers 16 varieties of pitaya plants. "As long as a fruit looks ridiculous, people will pay a premium for it."

—A. R. Williams



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THE FIELD MUSEUM, CHICAGO

ANIMAL BEHAVIOR

What's for Dinner? We Are

In 1898 British engineer J. H. Patterson (above) killed two huge lions. As we reported in our April 2002 feature, "Maneless in Tsavo," the pair had stalled railway construction in Kenya's Tsavo area by allegedly devouring 135 workers. Now two researchers at Chicago's Field

Museum of Natural History, Julian Kerbis Peterhans and Thomas Gnoske, have unearthed clues to understanding why the lions became man-eaters. Was it because they were sick or injured, as some suggest? The question is more than academic. Though numbers are difficult to come by, lions still

kill scores of people every year.

Poring over records from the Tsavo lions' reign of terror, the researchers discovered the duo may have developed a taste for human flesh from scavenging on the corpses of porters who died on caravans moving through the lions' territory. Disease had nearly eliminated the buffalo, their natural prey, perhaps making humans an appealing target. What's more, hunters had wiped out the elephants that once fed on the overgrown thorn thickets from which the Tsavo lions ambushed their human victims.

Peterhans and Gnoske did find that both lions' skulls had damaged teeth. "But we don't think that caused them to become man-eaters," says Peterhans. He estimates that only 15 percent of lions that hunt people or livestock are aged or injured. "Given the right circumstances," he says, "any lion is capable of attacking people."

—John L. Eliot

ENCLAVES

Still Seeing Red

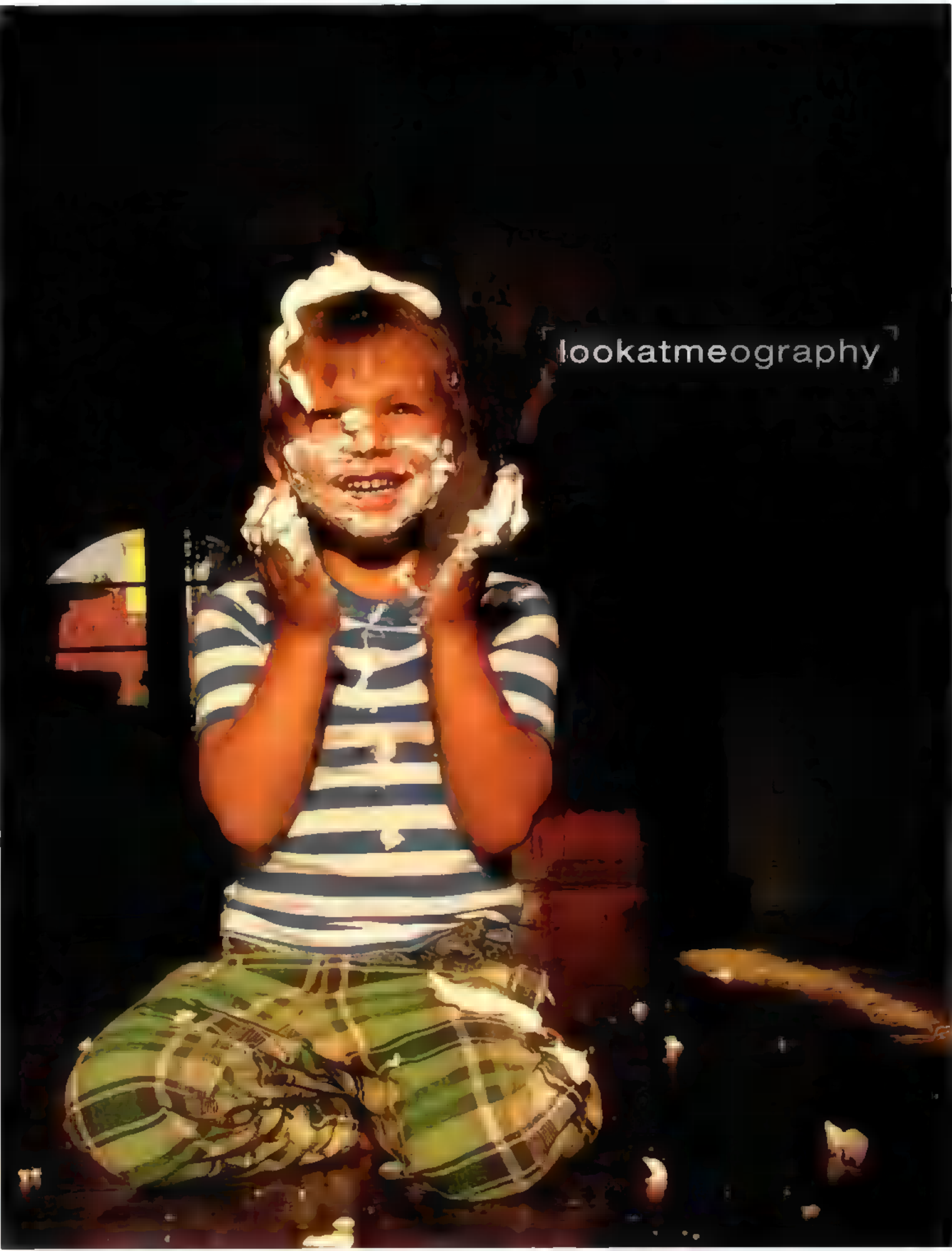
Almost 25 years have passed since China began its flirtation with capitalism, which is blossoming into a full-blown love affair. But one village is still holding a torch for Mao Zedong. After a brief experiment with decollectivization, the citizens of Nanjie decided to re-embrace the ideals of Maoism. Residents returned to communal living and ration books, and every apartment in town has been furnished with ■ Mao figurine. Recently Nanjie has become a retro-chic travel stop. Chinese tourists flock to glimpse sights like the People's Militia marching under banners that promote "eradicating old ways"—meaning capitalism.



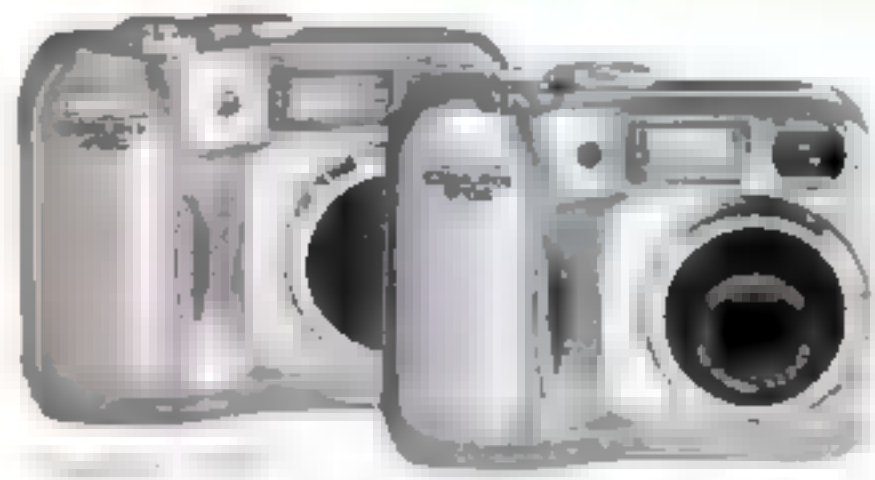
FRITZ HOFFMAN, DOCUMENT CHINA

But Nanjie's Maoist devotion is being tested. Officials are developing ■ business park to lure foreign investors, displacing more than ■ hundred villagers and prompting outrage

among Nanjie's 3,100 citizens. Apparently even the oversize statue of Mao that stands guard over the town square can't stop China's latest revolution. —Demetra Aposporos



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Behind the SCENES

AT THE NATIONAL GEOGRAPHIC SOCIETY



Photographs of Distinction

Gritty scenes of civil strife earn photographer a top honor

Randy Olson's harrowing images of war-torn Sudan in the February 2003 issue, along with his work for two articles from last year, have earned him a prestigious title: He's been named magazine photographer of the year in the University of Missouri's annual

Pictures of the Year competition. Randy is only the second photographer to have won both the competition's magazine and newspaper photographer of the year awards. Above is his picture of a Dinka boy in southern Sudan who has been treated with cattle dung, a makeshift

remedy for an infestation of lice.

A set of Randy's Black Sea photographs also took first place in the feature picture story category. Lynn Johnson's pictures in last November's article on weapons of mass destruction got top honors for an issue-reporting picture story, while Joel Sartore was awarded first place in the science and natural history category for a photograph in the March 2002 story on Attwater's prairie-chickens.

A Chicken's Progress

And speaking of those prairie-chickens: Numbers of the endangered bird are up, as is support from readers of our March 2002 article.

The survival rate after last fall's release of captive-bred

birds was the highest since 1996; there are now 58 of the wild grouse in two Texas populations, up from 40 in 2001. Readers gave more than \$6,000 in just one month to support breeding and research efforts. Go to nationalgeographic.com/ngm/0203 to contribute.



JOEL SARTORE

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A Celebration of Reefs

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VIEW BY DAVID DOUBILET

Observant readers who scanned all 730 of the special protected places listed in *NATIONAL GEOGRAPHIC*'s October 2002 article on UNESCO's World Heritage sites may have noticed one curious

fact: Only a handful of marine areas are included. One is the Belize Barrier Reef Reserve System, where National Geographic Explorer-in-Residence Sylvia Earle and Contributing Photographer-in-Residence David Doubilet last fall celebrated the World Heritage Convention's 30th anniversary.

"We were there as ambassadors for the ocean and its creatures," says Sylvia. "The World Heritage system is mostly terrestrial. People don't usually think of sea creatures as wildlife, but they are."

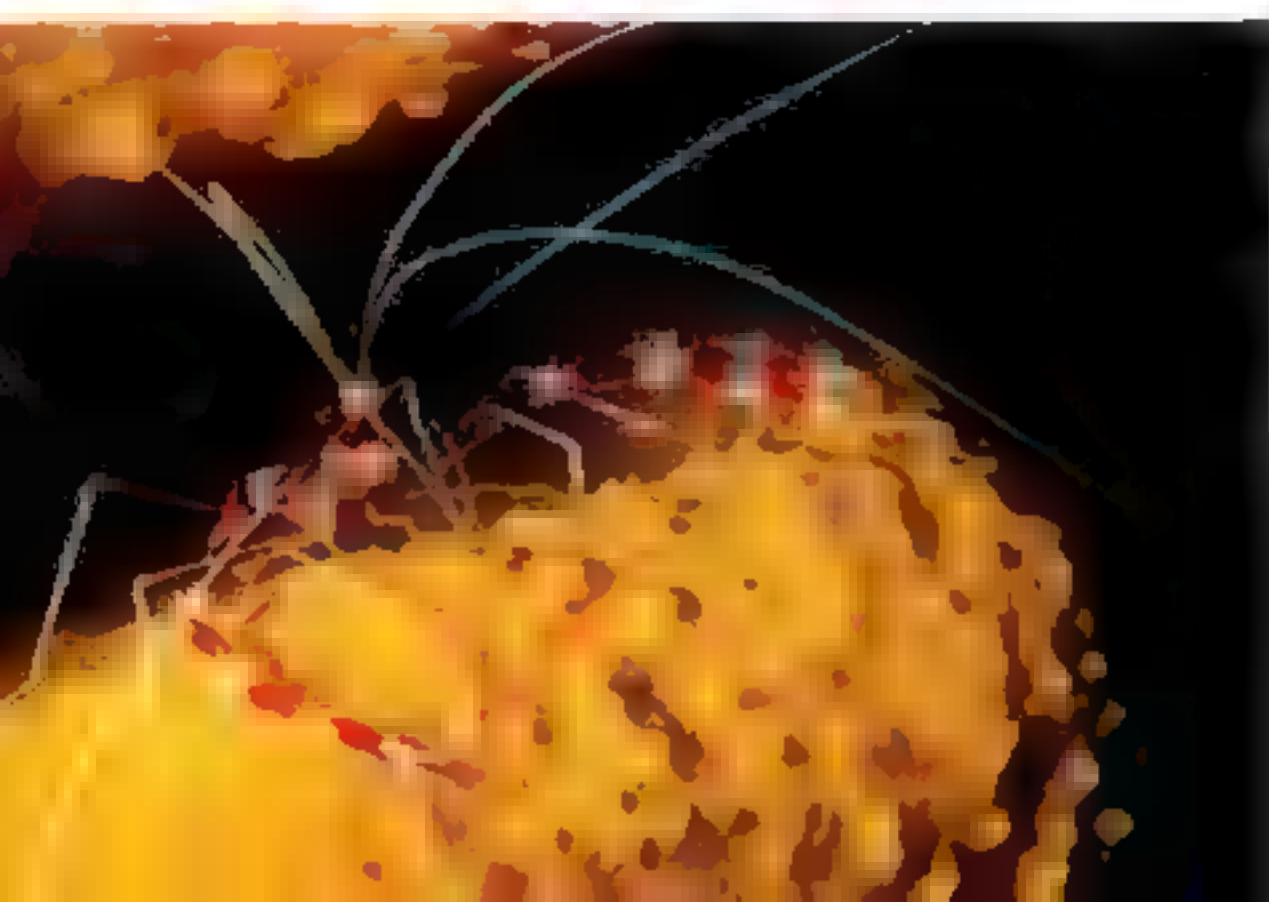
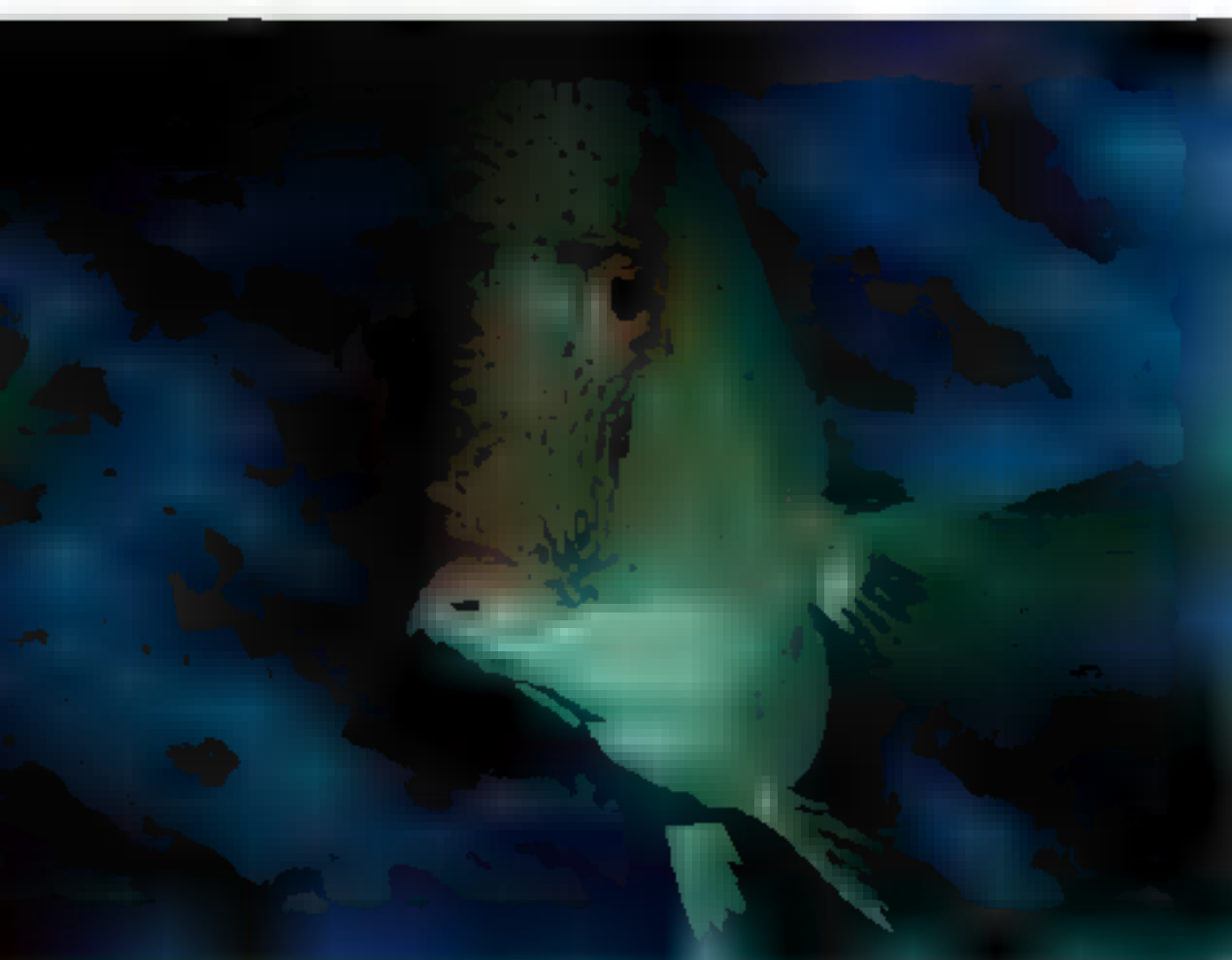
The Belize Barrier Reef System is the longest in the Western Hemisphere. (The world's longest, Australia's Great Barrier

Reef, is also a World Heritage site.) During Sylvia and David's ten-day expedition, they dove into the Blue Hole Natural Monument (above), a sinkhole

1,040 feet across and 410 feet deep. The pair also witnessed the remarkable variety of organisms that depend on the reef, from hogfish (left) to banded coral shrimp (bottom left). "Reefs in the Caribbean

have declined, as have most coastal habitats around the world," says Sylvia, "but the Belize

reefs remain in better condition than most." A multimedia look at Belize's barrier reefs, with narration by Sylvia and photographs by David, appears on the Web at nationalgeographic.com/earthpulse/belize.



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A New Path to Maya Tourism

Old dream comes to life

The October 1989 *GEOGRAPHIC* proposed the creation of an ecologically friendly tourist route linking Maya archaeological sites in Mexico, Belize, Honduras, Guatemala, and El Salvador. Early this year the project moved closer to reality as the five nations, spurred by the Inter-American Development Bank, joined the Society, Conservation International, and Counterpart International to create the Mundo Maya Sustainable Tourism Alliance. The goal: To build and maintain tourist attractions so the Maya and other local peoples can earn a living—while also preserving the environment.

CHECKING IN

... With Rescued Siberian Tiger Cubs

"They were helpless," wrote wildlife biologist Howard B. Quigley in the July 1993 *GEOGRAPHIC*. Quigley and his colleagues had found four Siberian tiger cubs whose mother had been killed by poachers in Russia's Sikhote-Alin Biosphere Reserve. Two of the cubs died while Quigley and his team were working frantically to ship them to Omaha's Henry Doorly Zoo, known for its work with big cats.

A decade later the two remaining siblings, a male and a female, are still alive, each producing its own offspring. The male, Khuntami (below), remains in Omaha and has

sired six cubs, two in 2000 and four in 2001. The female, now named Lena after her mother, lives in the Indianapolis Zoo. She gave birth to two cubs in 1998, three in 2000, and two more this year.

Releasing captive tigers into the wild is difficult. Instead, the hope is to provide a gene-pool safety net for the estimated 450 remaining Siberian tigers by transferring the zoo tigers' genetic material back into the wild via artificial insemination and embryo transfer. Says Lee Simmons, director of the Henry Doorly Zoo: "That's the best use of the captive population."



JOEL SARTORE

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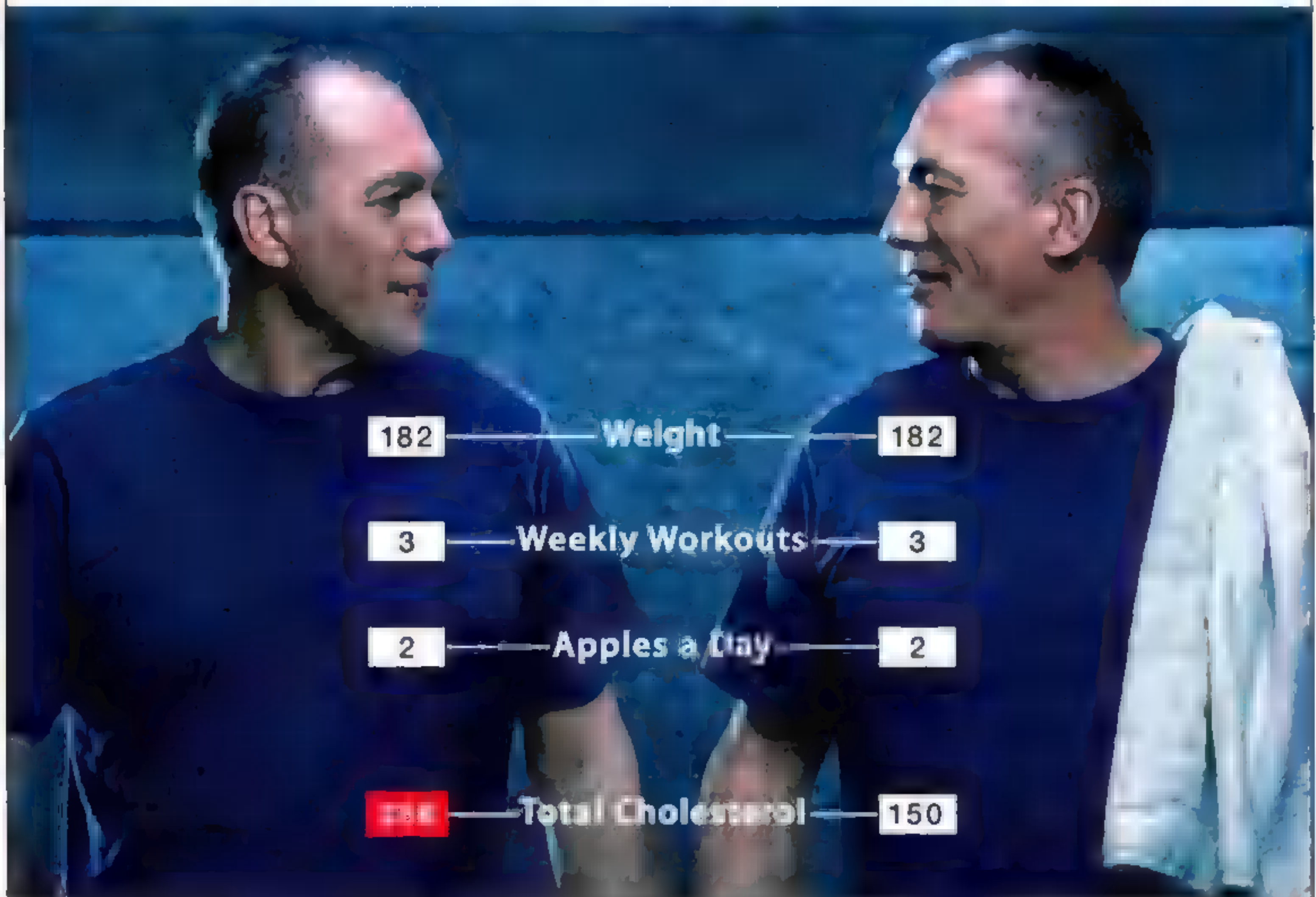
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AMAZONIA'S NATIVE CULTURES (PAGE 2)

- **Death on the Amazon** on the National Geographic Channel, August 4, 9 p.m. ET/PT. Follow Brazilian adventurer Sydney Possuelo on an emergency visit to the Korubo tribe. Witness the forces that threaten native groups, from drug smuggling and disease to tribal conflicts.
- **National Geographic Peoples of the World** book. A survey of indigenous groups worldwide, with vibrant photos and maps—including a section on the peoples of South America (\$40).
- **Amazon Expedition:** With National Geographic Expeditions, visit remote villages and experience life along Peru's Amazon River aboard the comfortable cruiser *La Amatista*, October 25–November 2, 2003. Go to nationalgeographic.com/ngexpeditions or call 1-888-966-8687.

Two of a kind. Until one took Lipitor.



Important information:

LIPITOR® (atorvastatin calcium) is a prescription drug used with diet to lower cholesterol. LIPITOR is not for everyone, including those with liver disease or possible liver problems, women who are nursing, pregnant, or may become pregnant. LIPITOR has not been shown to prevent heart disease or heart attacks.

If you take LIPITOR, tell your doctor about any unusual muscle pain or weakness. This could be a sign of serious side effects. It is important to tell your doctor about any medications you are currently taking to avoid possible serious drug interactions. Your doctor may do simple blood tests to monitor liver function before and during drug treatment. The most commonly reported side effects are gas, constipation, stomach pain and indigestion. They are usually mild and tend to go away.

Please see additional important information on next page.

Here's something that might make you think twice. Even if you do the right things, you can still have high cholesterol. In fact, for 2 out of 3 adults with high cholesterol, diet and exercise may not lower it enough. The good news is that LIPITOR can lower your total cholesterol 29% to 45%*. It can lower your bad cholesterol 39% to 60%*. (*The average effect depends on the dose.) So talk to your doctor today to find out if LIPITOR is right for you. To learn more, call us at 1-888-LIPITOR or find us on the web at www.lipitor.com.



LIPITOR
atorvastatin calcium

FOR CHOLESTEROL*

LIPITOR® (Atorvastatin Calcium) Tablets
Brief Summary of Prescribing Information

CONTRAINDICATIONS: Active liver disease or unexplained persistent elevations of serum transaminases. Hypersensitivity to any component of this medication. **Pregnancy and Lactation** — Atherosclerosis is a chronic process and discontinuation of lipid-lowering drugs during pregnancy should have little impact on the outcome of long-term therapy of primary hypercholesterolemia. Cholesterol and other products of cholesterol biosynthesis are essential components for fetal development (including synthesis of steroids and cell membranes). Since HMG-CoA reductase inhibitors decrease cholesterol synthesis and possibly the synthesis of other biologically active substances derived from cholesterol, they may cause fetal harm when administered to pregnant women. Therefore, HMG-CoA reductase inhibitors are contraindicated during pregnancy and in nursing mothers. **ATORVASTATIN SHOULD BE ADMINISTERED TO WOMEN OF CHILD-BEARING AGE ONLY WHEN SUCH PATIENTS ARE HIGHLY UNLIKELY TO CONCEIVE AND HAVE BEEN INFORMED OF THE POTENTIAL HAZARDS.** If the patient becomes pregnant while taking this drug, therapy should be discontinued and the patient apprised of the potential hazard to the fetus.

WARNINGS: Liver Dysfunction — HMG-CoA reductase inhibitors, like some other lipid-lowering therapies, have been associated with biochemical abnormalities of liver function. **Persistent elevations** (>3 times the upper limit of normal [ULN] occurring on 2 or more occasions) in serum transaminases occurred in 8.7% of patients who received atorvastatin in clinical trials. The incidence of these abnormalities was 0.2%, 0.2%, 0.6%, and 2.3% for 10, 20, 40, and 80 mg, respectively. One patient in clinical trials developed jaundice. Increases in liver function tests (LFT) in other patients were not associated with jaundice or other clinical signs or symptoms. Upon dose reduction, drug interruption, or discontinuation, transaminase levels returned to or near pretreatment levels without sequelae. Eighteen of 30 patients with persistent LFT elevations continued treatment with a reduced dose of atorvastatin. **It is recommended that liver function tests be performed prior to and at 12 weeks following both the initiation of therapy and any elevation of dose, and periodically (eg, semiannually) thereafter.** Liver enzyme changes generally occur in the first 3 months of treatment with atorvastatin. Patients who develop increased transaminase levels should be monitored until the abnormalities resolve. Should an increase in ALT or AST of >3 times ULN persist, reduction of dose or withdrawal of atorvastatin is recommended. Atorvastatin should be used with caution in patients who consume substantial quantities of alcohol and/or have a history of liver disease. Active liver disease or unexplained persistent transaminase elevations are contraindications to the use of atorvastatin (see CONTRAINDICATIONS).

Skeletal Muscle — Rare cases of rhabdomyolysis with acute renal failure secondary to myoglobinuria have been reported with atorvastatin and with other drugs in this class. Uncomplicated myalgia has been reported in atorvastatin treated patients (see ADVERSE REACTIONS). Myopathy, defined as muscle aches or muscle weakness in conjunction with increases in creatine phosphokinase (CPK) values >10 times ULN, should be considered in any patient with diffuse myalgias, muscle tenderness or weakness, and/or marked elevation of CPK. Patients should be advised to report promptly unexplained muscle pain, tenderness or weakness, particularly if accompanied by malaise or fever. Atorvastatin therapy should be discontinued if markedly elevated CPK levels occur or myopathy is diagnosed or suspected. The risk of myopathy during treatment with drugs in this class is increased with concurrent administration of cyclosporine, fibric acid derivatives, erythromycin, niacin, or azole antifungals. Physicians considering combined therapy with atorvastatin and fibric acid derivatives, erythromycin, immunosuppressive drugs, azole antifungals, or lipid-lowering doses of niacin should carefully weigh the potential benefits and risks and should carefully monitor patients for any signs or symptoms of muscle pain, tenderness, or weakness, particularly during the initial months of therapy and during any periods of upward dosage titration of either drug. Periodic creatine phosphokinase (CPK) determinations may be considered in such situations, but there is no assurance that such monitoring will prevent the occurrence of severe myopathy. **Atorvastatin therapy should be temporarily withheld or discontinued in any patient with an acute, serious condition suggestive of a myopathy or having a risk factor predisposing to the development of renal failure secondary to rhabdomyolysis (eg, severe acute infection, hypotension, major surgery, trauma, severe metabolic, endocrine and electrolyte disorders, and uncontrolled seizures).**

PRECAUTIONS: General — Before instituting therapy with atorvastatin, an attempt should be made to control hypercholesterolemia with appropriate diet, exercise, and weight reduction in obese patients, and to treat other underlying medical problems (see INDICATIONS AND USAGE in full prescribing information).

Information for Patients — Patients should be advised to report promptly unexplained muscle pain, tenderness, or weakness, particularly if accompanied by malaise or fever. **Drug Interactions** — The risk of myopathy during treatment with drugs of this class is increased with concurrent administration of cyclosporine, fibric acid derivatives, niacin (nicotinic acid), erythromycin, azole antifungals (see WARNINGS, Skeletal Muscle).

Antacid: When atorvastatin and Maalox® TC suspension were coadministered, plasma concentrations of atorvastatin decreased approximately 35%. However, LDL-C reduction was not altered. **Antipyria:** Because atorvastatin does not affect the pharmacokinetics of aspirin, interactions with other drugs metabolized via the same cytochrome P450 isozymes are not expected. **Colistipol:** Plasma concentrations of atorvastatin decreased approximately 25% when colistipol and atorvastatin were coadministered. However, LDL-C reduction was greater when atorvastatin and colistipol were coadministered than when either drug was given alone.

Cimetidine: Atorvastatin plasma concentrations and LDL-C reduction were not altered by coadministration of cimetidine. **Digoxin:** When multiple doses of atorvastatin and digoxin were coadministered, steady state plasma digoxin concentrations increased by approximately 20%. Patients taking digoxin should be monitored appropriately. **Erythromycin:** In healthy individuals, plasma concentrations of atorvastatin increased approximately 40% with coadministration of atorvastatin and erythromycin, a known inhibitor of cytochrome P450 3A4 (see WARNINGS, Skeletal Muscle). **Oral Contraceptives:** Coadministration of atorvastatin and an oral contraceptive increased AUC values for norethindrone and ethinyl estradiol by approximately 30% and 20%. These increases should be considered when selecting an oral contraceptive for a woman taking atorvastatin.

Warfarin: Atorvastatin had no clinically significant effect on prothrombin time when administered to patients receiving chronic warfarin treatment. **Endocrine Function** — HMG-CoA reductase inhibitors interfere with cholesterol synthesis and theoretically might blunt adrenal and/or gonadal steroid production. Clinical studies have shown that atorvastatin does not reduce basal plasma cortisol concentration or inhibit adrenal reserve. The effects of HMG-CoA reductase inhibitors on male fertility have not been studied in adequate numbers of patients. The effects, if any, on the pituitary-gonadal axis in premenopausal women are unknown. Caution should be exercised if an HMG-CoA reductase inhibitor is administered concomitantly with drugs that may decrease the levels or activity of endogenous steroid hormones, such as ketoconazole, spiroolactone, and cimetidine. **CNS Toxicity** — Brain hemorrhage was seen in a female dog treated for 3 months at 120 mg/kg/day. Brain hemorrhage and optic nerve vacuolation were seen in another female dog that was sacrificed in a terminal condition after 11 weeks of escalating doses up to 200 mg/kg/day. The 120 mg/kg dose resulted in a systemic exposure approximately 16 times the human plasma area under the curve (AUC, 0-24 hours) based on the maximum human dose of 80 mg/day. A single tonic convulsion was seen in each of 2 male dogs (one treated at 10 mg/kg/day and one at 120 mg/kg/day) in a 2-year study. No CNS lesions have been observed in mice after chronic treatment for up to 2 years at doses up to 400 mg/kg/day or in rats at doses up to 100 mg/kg/day. These doses were 6 to 11 times (mouse) and 8 to 16 times (rat) the human AUC (0-24) based on the maximum recommended human dose of 80 mg/day. CNS vascular lesions, characterized by perivascular hemorrhages, edema, and mononuclear cell infiltration of perivascular spaces, have been observed in dogs treated with other members of this class. A chemically similar drug in this class produced optic nerve degeneration (Wallerian degeneration of retinogeniculate fibers) in clinically normal dogs in a dose dependent fashion at a dose that produced plasma drug levels about 30 times higher than the mean drug level in humans taking the highest recommended dose.

Carcinogenesis, Mutagenesis, Impairment of Fertility — In a 2-year carcinogenicity study in rats at dose levels of 10, 30, and 100 mg/kg/day, 2 rare tumors were found in muscle in high-dose females; in one, there was a rhabdomyosarcoma and in another, there was a fibrosarcoma. This dose represents a plasma AUC (0-24) value of approximately 16 times the mean human plasma drug exposure after an 80 mg oral dose. A 2-year carcinogenicity study in mice given 100, 200, or 400 mg/kg/day resulted in a significant increase in liver adenomas in high-dose males and liver carcinomas in high-dose females. These findings occurred at plasma AUC (0-24) values of approximately 6 times the mean human plasma drug exposure after an 80 mg oral dose. *In vitro*, atorvastatin was not mutagenic or clastogenic in the following tests with and without metabolic activation: the Ames test with *Salmonella typhimurium* and *Escherichia coli* the HGPRT forward mutation assay in Chinese hamster lung cells and the chromosomal aberration assay in Chinese hamster lung cells. Atorvastatin was negative in the *in vivo* mouse micronucleus test. Studies in rats performed at doses up to 175 mg/kg (15 times the human exposure) produced no changes in fertility. There was epispadias and epispadias in the epididymis of 2 of 10 rats treated with 100 mg/kg/day of atorvastatin for 3 months (16 times the human AUC at the 80 mg dose); testis weights were significantly lower at 30 and 100 mg/kg and epididymal weight was lower at 100 mg/kg. Male rats given 100 mg/kg/day for 11 weeks prior to mating had decreased sperm motility, sperm head concentration, and increased abnormal sperm. Atorvastatin caused no adverse effects on semen parameters, or reproductive organ histopathology in dogs given doses of 10, 40, or 120 mg/kg for two years. **Pregnancy** — **Pregnancy Category X: See CONTRAINDICATIONS.** Safety in pregnant women has not been established. Atorvastatin crosses the rat placenta and reaches a level in fetal liver equivalent to that of maternal plasma. Atorvastatin was not teratogenic in rats at doses up to 300 mg/kg/day or in rabbits at doses up to 100 mg/kg/day. These doses resulted in multiples of about 30 times (rat) or 20 times (rabbit) the human exposure based on surface area (mg/m²). In a study in rats given 20, 100, or 225 mg/kg/day, from gestation day 7 through to lactation day 21 (weaning), there was decreased pup survival at birth, neonatal, weaning, and maturity in pups of mothers dosed with 225 mg/kg/day. Body weight was decreased on days 4 and 21 in pups of mothers dosed at 100 mg/kg/day, pup body weight was decreased at birth and at days 4, 21, and 51 at 225 mg/kg/day. Pup development was delayed (rotarod performance at 100 mg/kg/day and acoustic startle at 225 mg/kg/day, pinna detachment and eye opening at 225 mg/kg/day). These doses correspond to 8 times (100 mg/kg) and 22 times (225 mg/kg) the human AUC at 80 mg/day. Rare reports of congenital anomalies have been received following intrauterine exposure to HMG-CoA reductase inhibitors. There has been one report of severe congenital bony deformity, tracheo-esophageal fistula, and anal atresia (VATER association) in a baby born to a woman who took lovastatin with dextropropriamine sulfate during the first trimester of pregnancy. LIPITOR

should be administered to women of child-bearing potential only when such patients are highly unlikely to conceive and have been informed of the potential hazards. If the woman becomes pregnant while taking LIPITOR, it should be discontinued and the patient advised again as to the potential hazards to the fetus. **Nursing Mothers** — Nursing rat pups had plasma and liver drug levels of 50% and 40%, respectively, of that in their mother's milk. Because of the potential for adverse reactions in nursing infants, women taking LIPITOR should not breast-feed (see CONTRAINDICATIONS). **Pediatric Use** — Safety and effectiveness in patients 10-17 years of age with heterozygous familial hypercholesterolemia have been evaluated in controlled clinical trials of 6 months duration in adolescent boys and postmenarcheal girls. Patients treated with LIPITOR had an adverse experience profile generally similar to that of patients treated with placebo; the most common adverse experiences observed in both groups, regardless of causality assessment, were infections. **Doses greater than 20 mg have not been studied in this patient population.** In this limited controlled study, there was no detectable effect on growth or sexual maturation in boys or on menstrual cycle length in girls. See CLINICAL PHARMACOLOGY, Clinical Studies section in full prescribing information. **ADVERSE REACTIONS, Pediatric Patients, and DOSAGE AND ADMINISTRATION, Pediatric patients (10-17 years of age) with Heterozygous Familial Hypercholesterolemia** in full prescribing information. Adolescent females should be counseled on appropriate contraceptive methods while on LIPITOR therapy (see CONTRAINDICATIONS and PRECAUTIONS, Pregnancy). **LIPITOR has not been studied in controlled clinical trials involving pre-pubertal patients or patients younger than 10 years of age.** Clinical efficacy with doses up to 80 mg/day for 1 year have been evaluated in an uncontrolled study of patients with homozygous FH including 8 pediatric patients. See CLINICAL PHARMACOLOGY, Clinical Studies in Homozygous Familial Hypercholesterolemia in full prescribing information. **Geriatric Use** — The safety and efficacy of atorvastatin (10-80 mg) in the geriatric population (≥65 years of age) was evaluated in the ACCESS study. In this 54-week open-label trial, 1,958 patients initiated therapy with atorvastatin 10 mg. Of these, 835 were elderly (≥65 years) and 1,123 were non-elderly. The mean change in LDL-C from baseline after 8 weeks of treatment with atorvastatin 10 mg was -38.2% in the elderly patients versus -34.6% in the non-elderly group. The rates of discontinuation due to adverse events were similar between the two age groups. There were no differences in clinically relevant laboratory abnormalities between the age groups.

ADVERSE REACTIONS: LIPITOR is generally well-tolerated. Adverse reactions have usually been mild and transient. In controlled clinical studies of 2502 patients, <2% of patients were discontinued due to adverse experiences attributable to atorvastatin. The most frequent adverse events thought to be related to atorvastatin were constipation, flatulence, dyspepsia, and abdominal pain. **Clinical Adverse Experiences** — Adverse experiences reported in ≥2% of patients in placebo-controlled clinical studies of atorvastatin, regardless of causality assessment, are shown in the following table.

Adverse Events in Placebo-Controlled Studies (% of Patients)

BODY SYSTEM Adverse Event	Placebo	Atorvastatin	Atorvastatin	Atorvastatin	Atorvastatin
	N = 270	N = 863	N = 36	N = 78	N = 94
BODY AS A WHOLE					
Infection	10.0	10.3	2.8	10.1	7.4
Headache	7.0	5.4	16.7	2.5	6.4
Accidental Injury	3.7	4.2	0.0	1.3	3.2
Ru Syndrome	1.9	2.2	0.0	0.0	3.2
Abdominal Pain	0.7	2.8	0.0	3.8	2.1
Back Pain	3.0	2.8	0.0	3.8	1.1
Allergic Reaction	2.8	0.9	2.8	1.3	0.0
Asthenia	1.9	2.2	0.0	3.8	0.0
DIGESTIVE SYSTEM					
Constipation	1.8	2.1	0.0	2.5	1.1
Diarrhea	1.5	2.7	0.0	3.8	5.3
Dyspepsia	4.1	2.3	2.8	1.3	2.1
Flatulence	3.3	2.1	0.0	1.3	1.1
RESPIRATORY SYSTEM					
Sinusitis	2.6	2.8	0.0	2.5	6.4
Pharyngitis	1.5	2.5	0.0	1.3	2.1
SKIN AND APPENDAGES					
Rash	0.7	3.9	2.8	0.0	1.1
MUSCULOSKELETAL SYSTEM					
Arthralgia	1.5	2.0	0.0	5.1	0.0
Myalgia	1.1	3.2	5.6	1.3	0.0

The following adverse events were reported, regardless of causality assessment in patients treated with atorvastatin in clinical trials. The events in *italics* occurred in ≥2% of patients and the events in plain type occurred in <2% of patients.

Body as a Whole: Chest pain, face edema, fever, neck rigidity, malaise, photosensitivity reaction, generalized edema. **Digestive System:** Nausea, gastroenteritis, liver function tests abnormal, colitis, vomiting, gastritis, dry mouth, rectal hemorrhage, esophagitis, eructation, glossitis, mouth ulceration, anorexia, increased appetite, stomatitis, biliary pain, cheilitis, duodenal ulcer, dysphagia, enteritis, melena, gum hemorrhage, stomach ulcer, tenesmus, ulcerative stomatitis, hepatitis, pancreatitis, cholestatic jaundice. **Respiratory System:** Bronchitis, rhinitis, pneumonia, dyspnea, asthma, epistaxis. **Nervous System:** Insomnia, dizziness, paresthesia, somnolence, amnesia, abnormal dreams, libido decreased, emotional lability, incoordination, peripheral neuropathy, toricollis, facial paralysis, hyperkinesia, depression, hypesthesia, hyperhidrosis. **Musculoskeletal System:** Arthritis, leg cramps, bursitis, tenosynovitis, myasthenia, tendinous contracture, myositis. **Skin and Appendages:** Pruritus, contact dermatitis, alopecia, dry skin, sweating, acne, urticaria, eczema, seborrhea, sun ulcer. **Urogenital System:** Urinary tract infection, urinary frequency, cystitis, hematuria, impotence, dysuria, kidney calculus, nocturia, epididymitis, fibrocystic breast, vaginal hemorrhage, albuminuria, breast enlargement, metrorrhagia, nephritis, urinary incontinence, urinary retention, urinary urgency, abnormal ejaculation, uterine hemorrhage. **Special Senses:** Amblyopia, tinnitus, dry eyes, refraction disorder, eye hemorrhage, deafness, glaucoma, parosmia, taste loss, taste perversion. **Cardiovascular System:** Palpitation, vasodilatation, syncope, migraine, postural hypotension, phlebitis, arrhythmia, angina pectoris, hypertension. **Metabolic and Nutritional Disorders:** Peripheral edema, hyperglycemia, creatine phosphokinase increased, gout, weight gain, hypoglycemia. **Hemic and Lymphatic System:** Echinymosis, anemia, lymphadenopathy, thrombocytopenia, petechia. **Postintroduction Reports** — Adverse events associated with LIPITOR therapy reported since market introduction, that are not listed above, regardless of causality assessment, include the following: encephalitis, angioneurotic edema, bullous rashes (including erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis), and rhabdomyolysis. **Pediatric Patients (ages 10-17 years)** In a 26-week controlled study in boys and postmenarcheal girls (n=140), the safety and tolerability profile of LIPITOR 10 to 20 mg daily was generally similar to that of placebo (see CLINICAL PHARMACOLOGY, Clinical Studies section in full prescribing information and PRECAUTIONS, Pediatric Use).

OVERDOSAGE: There is no specific treatment for atorvastatin overdosage. In the event of an overdose, the patient should be treated symptomatically, and supportive measures instituted as required. Due to extensive drug binding to plasma proteins, hemodialysis is not expected to significantly enhance atorvastatin clearance.

Please see full prescribing information for additional information about LIPITOR.
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Who Knew?

COSMOLOGY

The Multiverse

The universe as we know it just got more complicated

The universe is bigger than we think. This seems to be a cosmic truth. Times change, theories evolve, astronomers see new things in their telescopes—and the universe always turns out to be vaster and more mind-boggling than anyone suspected. The most dazzling new theory holds that our universe isn't just big, it's one of many. It's like a bubble in a huge vat of beer, and every other bubble is another universe. (We like this image for some reason.)

Our concept of the universe used to be tidier. Ancient Egyptians thought the sky was held up by mountains at the corners of the Earth, and the stars were not so far away. But in the 17th century the telescope shattered that notion. Through the lens, the stars were countless, and space had depth. Stars were suns, rendered faint only by great distance. Then, in 1923, Edwin Hubble proved that mysterious, wispy things called nebulae are actually galaxies, or "island universes," outside our own.

New telescopes have since revealed ever more galaxies, and we've grown accustomed to living in Carl Sagan's cosmos, with *billions and billions* of galaxies, each utterly lousy with stars. But Sagan may have been underestimating.

A satellite called the Wilkinson Microwave Anisotropy Probe recently captured a glimpse of the residual radiation from the young universe, when there were no galaxies, only

perturbations in a seething, expanding cosmos. The data give a precise age to the universe: 13.7 billion years, plus or minus 200 million years. Perhaps more significantly, the data support the idea of cosmic inflation, a variant of the big bang. The inflationary theory states that very early in the expansion the cosmos suddenly inflated, becoming unimaginably vast in a fraction of a second.

If inflation is correct, the universe really is more than a million trillion trillion trillion times larger than the already enormous visible cosmos. It's practically infinite in scale. You have to speak like a child to convey the idea—it's basically a gazillion times larger than we thought. And there's more: One variation of the inflation theory suggests that our universe is a calm bubble, a kind of "no inflation zone" within an infinitely large, chaotic, eternally inflating "multiverse," and that this multiverse contains countless bubble universes, some of which almost surely contain intelligent observers trying to make sense of their own crazy cosmos.

The problem is, a multiverse is a hard theory to prove. "Is this science? Not yet," warns cosmologist Michael Turner of the University of Chicago. "We can't test it."

But here's the most alarming part about living in a multiverse. If the cosmos is more or less infinite in scale, then statistical probabilities dictate that somewhere there's a planet identical to Earth, containing creatures identical to us, leading identical lives.

We don't buy it. Could there really be another world where Adam Sandler is a movie star?

—Joel Achenbach

WASHINGTON POST STAFF WRITER

IT MATTERS


How far apart are those two planets?

Scientists measure length in meters. Kilometers and centimeters are just multiples and fractions (respectively) of the basic unit. But exactly how long is a meter? Since 1983 the International Bureau of Weights and Measures in Sèvres, France (keepers by treaty of the world's standard units of measurement), has decreed that a meter is precisely the distance light travels through a vacuum in 1/299,792,458 of a second. (How do you measure a hundred-millionth of a second? Don't ask.) That degree of precision matters. If astronomers measured a meter the way most Americans do ("Y'know, about ■ yard") imprecision would multiply prodigiously. Just between Earth and Mars you'd get a measurement mistake four million miles long.

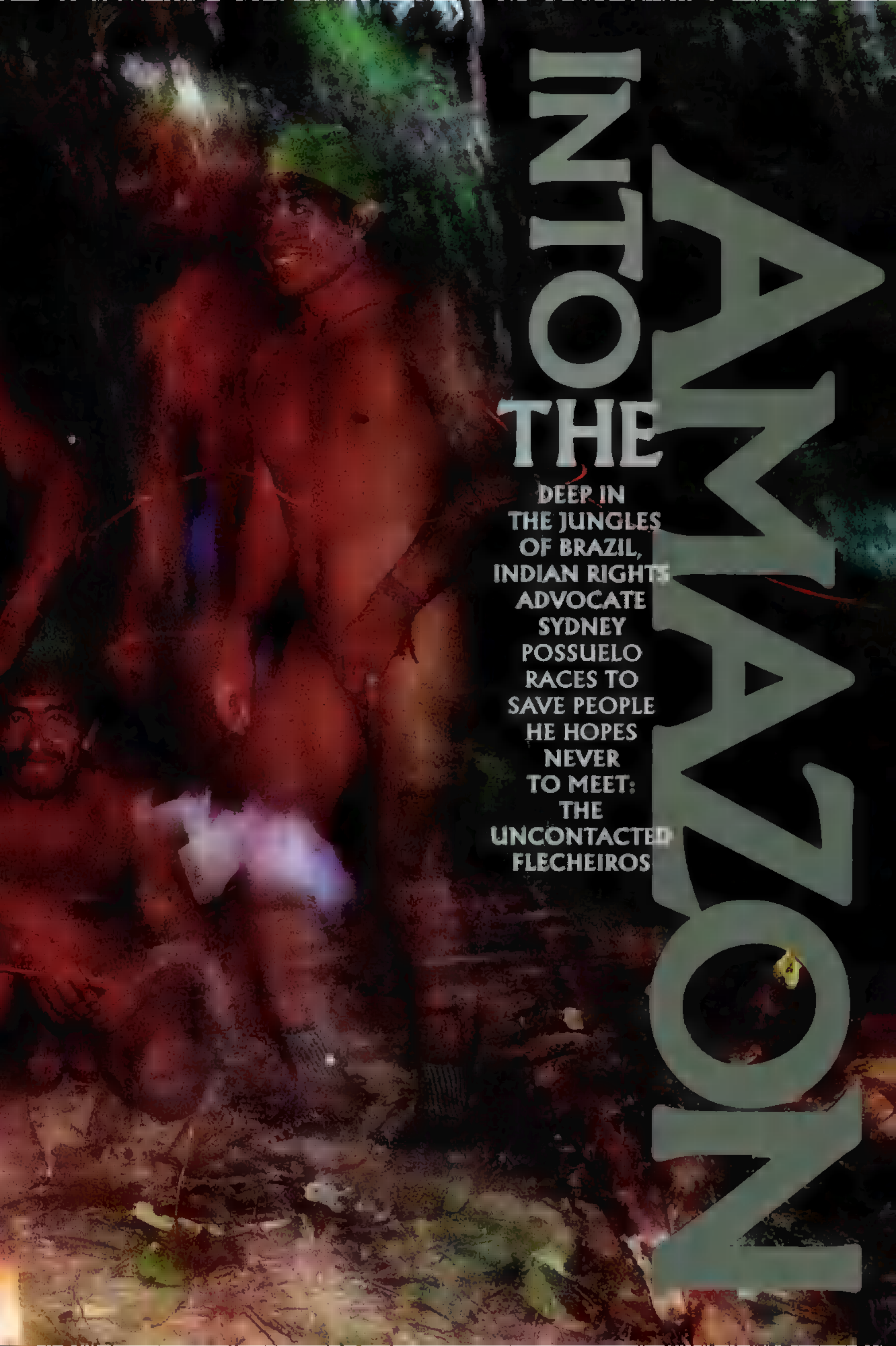
—Lynne Warren

WEBSITE EXCLUSIVE

Learn more about the shape of the cosmos and find links ■ Joel Achenbach's work at nationalgeographic.com/ngm/resources/0308.



In the heat of the night, Alfredo, Bejou, José, and Ramil—Kanamari Indians who have joined Sydney Possuelo's expedition to safeguard the Flecheiros—strip and slather themselves with fruit seeds for a ritual dance that begins a bit self-consciously. Outsiders are watching, camera and pen in hand. And as Possuelo and the Kanamari are well aware, outsiders change everything.



INTO THE MAYAN JUNGLE

DEEP IN
THE JUNGLES
OF BRAZIL,
INDIAN RIGHTS
ADVOCATE
SYDNEY
POSSUELO
RACES TO
SAVE PEOPLE
HE HOPES
NEVER
TO MEET:
THE
UNCONTACTED
FLECHEIROS





Snaking deep into remote territory, stretches of the Itaquai River have not yet been plundered, as have more accessible parts of the Amazon, where gold and oil, rubber and timber, slaves and souls have fueled 500 years of conquest, disease, and devastation. Brazil's Indian population, once in the millions, is now roughly 350,000, including a few uncontacted tribes like the Flecheiros—the Arrow People.

A group of men are in a dugout canoe on a river. The canoe is made of a single large log and is filled with men. Some are using paddles. The background is a dense tropical forest with a riverbank. The scene is captured in a slightly blurred, artistic style.

BY SCOTT WALLACE

PHOTOGRAPHS BY NICOLAS BENNEN

W

We found fresh human marks all over the river. They all pointed in the same direction that we're walking through the tight jungle of Brazil's westernmost Amazon Basin. Woolly monkeys howl and chatter somewhere in the distance, their banter punctuated by the occasional zing of a machete and the shrill cries of screaming piha birds high in the canopy overhead. Our column of 34 men proceeds in silence, strung out single file far back into the forest. Only one or two companions are visible at any time in the blur of electric greens and rain-soaked browns. The rest are swallowed from view by a spray of overhanging branches and vines as thick as anacondas dangling

Leading expeditions with missionary zeal, Sydney Possuelo, right center, is driven by a gospel of his own: "I don't need to know what language the Flecheiros speak or what gods they worship. I just want to protect them."



THE KANAMARI INDIANS
ALL AGREED ON THIS:
THE FLECHEIROS ARE
DANGEROUS—“UNTAMED.”



To help achieve Possuelo's long-term goal—discovering where the Flecheiros live so authorities can more effectively keep out intruders—the 34-man crew first takes care of short-term essentials. Stopping along the Itaquai River to hunt for dinner, they bag a load of peccary (above). When their boats bottom out upstream, the team members pack their gear and slog along on foot (top left). Some Indians on the trek treat their eyes with a traditional potion applied with palm leaves (middle). Brutally painful, the drug alters vision, giving the jungle's dense green walls greater texture and dimension—and making it easier to spot a woolly monkey (bottom) for a quick meal.



a hundred feet from the treetops to the forest floor. Just ahead of me, Sydney Possuelo strides double-time across a stretch of level ground, a welcome break from the steep hillsides we've been scrambling over for days. "We're probably the only ones who have ever walked here," he tells me. "Us and the Indians."

A cantankerous iconoclast with bulging hazel eyes, scraggly salt-and-pepper beard, and wild locks flowing from beneath a floppy camouflage jungle hat, Possuelo, 63, is widely considered one of the Amazon's last great wilderness scouts and the leading authority on Brazil's remaining pockets of isolated Indians. After two weeks of river travel and 20 days of steady bushwhacking, Possuelo has led us into one of the most remote and uncharted places left on the planet, near the headwaters of two adjacent

ivers, the Itaquai and the Jutai. This is the land of the mysterious Flecheiros, or Arrow People, a rarely glimpsed Indian tribe known principally as deft archers disposed to unleashing poison-tipped projectiles to defend their territory against all intruders, then melting away into the forest.

Suddenly Possuelo stops in his tracks. A freshly hacked sapling, still dangling by a shred of bark, lies across the path in front of us. In itself, the makeshift gate could not halt a toddler, much less a column of nearly three dozen armed men. But still, it bears a message—and a warning—that Possuelo instantly recognizes and respects. "This is universal language in the jungle," he whispers. "It means 'Stay Out. Go No Farther.' We must be getting close to their village."

Which is something Possuelo wants to avoid. He wheels around and with a silent, dramatic

INTO THE AMAZON



wave directs our column to veer off the path into the dense undergrowth on our flanks. A half hour later, after slogging through boot-sucking mud and dodging branches that swarm with fire ants, we arrive by the steep banks of a clear, narrow creek, where Possuelo orders a halt to the march while we wait for stragglers to catch up.

The Flecheiros figure among 17 so-called uncontacted tribes living in the far recesses of the Brazilian Amazon. In this part of the rain forest, the Vale do Javari Indigenous Area, there may be as many as 1,350 uncontacted indigenous people—perhaps the largest such concentration anywhere in the world. Most of them are descendants of the survivors of massacres perpetrated by white intruders over the centuries. The Indians then scattered into the rugged folds of the region's headwaters and continue to shun contact with the outside world.

But violent clashes account for only a fraction of the deaths suffered by native communities at the hands of outsiders. Most died from epidemic diseases, including the common cold, for which they had no biological defenses. Ivan Arapa, one of our scouts, is from the Matis tribe, who were first contacted by the outside world about 25

years ago. Ivan still remembers the wholesale death that accompanied these very first visits of Brazilian government officials to his village.

"Everyone was coughing, everyone was dying," he recalls. "Many, many Matis died. We didn't know why."

More than half of the 350 Matis living along the Ituí River inside the Javari reserve perished in the months following contact, officials say.

IT'S A DISMAL STORY THAT'S become all too familiar to Possuelo during his 40-year career as a *sertanista*, a uniquely Brazilian profession that folds all the skills and passions of a frontiersman, ethnographer, adventurer, and Indian rights activist into a single, eclectic vocation. That's why our mission is not to make contact with the Flecheiros but rather to gather information on the extent of their territory's boundaries, information Possuelo will use to bolster his efforts to protect their lands. In other respects, the Flecheiros are to remain, in large measure, a mystery.

As we passed through squalid Kanamari Indian settlements on our way up the Itaquai River a month earlier, villagers gave vague,

contradictory tales of the Flecheiros—third- or fourth-hand accounts, translated in halting Portuguese, of sightings of the Indians and clashes between them and logging crews that once operated in the area. Some said the Flecheiros are tall and muscular with long, flowing hair. Others told us they paint their faces and bodies red and clip their hair in a classic bowl shape common to many Amazon tribes. But the Kanamari all agreed on this: The Flecheiros are dangerous, “untamed,” they said, and villagers carefully steered clear of Flecheiros lands upriver. “We don’t go there,” said a Kanamari man we met one afternoon as he paddled a small dugout in the honey-colored waters. “There are *indios bravos*, wild Indians, up there. That’s their territory.”

These are stories Possuelo actually likes to hear. In his encounters with the Kanamari he actively nourishes an image of the Flecheiros as a deadly peril to be avoided. “I prefer them like this—violent,” Possuelo says. Isolated tribes willing to kill intruders to defend their lands, or that have a reputation for doing so, make the most tenacious guardians of the pristine forest.

Beginning at an outpost south of Tabatinga, Possuelo’s thousand-mile trek traverses a swath of the Vale do Javari Indigenous Area (map), nominally a safe haven for roughly 3,900 Indians. The sanctuary’s southeastern flank, however, is barely monitored, leaving uncontacted tribes vulnerable to encroachment by non-natives. Possuelo’s trackers relied on small tips—footprints, a chewed wad of sugarcane, a snapped sapling (below)—to locate the Flecheiros without making contact.



“THIS IS UNIVERSAL LANGUAGE IN THE JUNGLE,” POSSUELO WHISPERS. “IT MEANS ‘STAY OUT. GO NO FARTHER.’ WE MUST BE GETTING CLOSE TO THEIR VILLAGE.”

At the same time, isolation offers groups like the Flecheiros the best hope for maintaining their cultural vibrancy, even their very survival. This interplay between ecological preservation and the protection of uncontacted tribes lies at the heart of Possuelo’s work. “In protecting the isolated Indian, you are also protecting millions of hectares of biodiversity,” he says.

During the past few days we’ve found signs of the Flecheiros everywhere: crude blazes hacked into tree trunks, decaying old lean-tos, overgrown footpaths. All bear witness to an isolated, semi-nomadic people still living beyond the reach of our “civilized” world in a distant, virtually Neolithic past. Yesterday afternoon we broke through dense underbrush into a sunlit clearing to behold a cluster of low-lying palm-roofed huts that looked more like hobbit dwellings than shelters for full-grown human

beings. It appeared to be an abandoned fishing camp. Two tapir jawbones, still filled with teeth, were slung from a small tree, some kind of totem, Possuelo surmised. A cone-shaped cage fashioned from sticks gouged into the ground sat nearby. Alongside it lay a perfectly round, soot-blackened clay pot. “These Indians are very close to the way Amerigo Vespucci would have found them,” Possuelo said with a touch of marvel and admiration in his voice. “They live by hunting, fishing, and gathering.”

Most of the vestiges we have found are days, weeks, even months old—far enough away in time to presume a relative margin of safety in distance between the Flecheiros and our expedition. An experienced tracker like Possuelo can observe such signs and instantly date them. The fishing camp, Possuelo figured, was from the previous dry season, the time of year when





Tepi was born roughly 25 years ago, about the time when his tribe, the Matis, was first contacted by outsiders. Although he has visited Brazil's urban jungles, he now embraces the traditions of his own, including tattoos, and nose and ear ornaments. "The Indians are very serene," says Possuelo, who hired Tepi as a hunter and tracker. "They think white people talk too much."



floodwaters draw back from the forest floor, and animals as well as humans move toward the Amazon's larger rivers and streams in a primordial quest for food and water.

But shortly after we departed the camp, our scouts came upon fresh signs of the Flecheiros, a piece of coiled vine and a chunk of masticated sugarcane left on the path. "These are from right now!" Ivan Arapa whispered excitedly. Just ahead we found fresh footprints. Possuelo read the skid marks left in the mud and said: "He saw us and took off running." He raised his hand for silence and sent word for all to maintain visual contact with one another along our single column that stretched far back into the forest. For the first time since our journey began, Possuelo strapped on his pistol.

Minutes later, our trailblazers glimpsed a pair

of naked Indians as they dashed across a log footbridge and vanished into closed jungle on the far side of the river. Possuelo tried to reassure them of our peaceful intent, calling out into the forest: "Whooo! Whooo!" Only the forlorn cry of the screaming piha replied.

And last night, another first: Possuelo posted sentries to keep vigil as we slept fitfully in our hammocks, straining our ears above an eerie, reverberating chorus of frogs for any snapping of twigs or rustling of leaves that could signal an approach by the Flecheiros. As we got under way this morning, Possuelo ordered the men to leave behind a machete and a knife as a peace offering. Does Possuelo suppose the Flecheiros will subject our campsite to the same sort of forensic scrutiny we have brought to bear on theirs?



FOR THE FIRST TIME
SINCE OUR JOURNEY BEGAN,
POSSUELO STRAPPED
ON HIS PISTOL.



Fresh footprints, maybe 15 minutes old (top right), indicate that the Flecheiros are nearby. Are they preparing to attack? That danger doesn't dampen the curiosity of two team members. Ignoring Possuelo's first commandment—thou shalt not make contact—the pair sneaks away to explore the area and stumbles upon an empty Flecheiros village. They find and later try on ceremonial masks made from long strips of tree bark (above), and discover pots with curare, a poison put on arrows and darts. Turning up only one weapon—a broken blowgun and dart (middle)—Possuelo's men keep their eyes open and rifles ready (right). Perhaps dozens of Flecheiros live here. Where have they gone?



"Com certeza," he replies. "You can bet on it." What might they be thinking about us? He looks me straight in the eye and answers with an edge of foreboding. "I imagine they're thinking that their enemies have arrived."

NOW, HAVING detoured around the strange Flecheiros roadblock, the men reach the embankment in groups of three and four, staggering under the weight of their backpacks overstuffed with provisions, collapsing around us on the damp forest floor. Among us there are a dozen Matis Indians, six Kanamari, two Marubo, and the rest mostly non-Indian frontiersmen. We guzzle water straight from the stream, but as the minutes wear on and Possuelo takes a head count he realizes that two of our Kanamari porters are missing. Laughter gives way to a tense silence. Possuelo paces back and forth, stealing glances at his wristwatch with a scowl. Though it's approaching midday and we're only a few degrees off the Equator, I've begun to shiver in my sweat-drenched fatigues.

"Damn it!" Possuelo snarls. "These guys are holding us up! A total lack of discipline!" With that, he dispatches a half dozen Matis to look for the stragglers. But when the Matis fail to return, an unspoken dread slowly creeps over all of us. Have our missing companions been captured, perhaps even killed, by the Flecheiros?

This certainly isn't the first potentially life-threatening crisis Possuelo has faced in his career. He was once held hostage by Kayapó warriors and on another occasion was pistol-whipped by white settlers seeking to invade Indian lands. He's had malaria 38 times and has received as many death threats. In the early 1990s as president of FUNAI, the Brazilian government agency that deals with indigenous peoples, Possuelo squared off with army generals, influential politicians, and a violent rabble of gold prospectors to win protection for the



homelands of the Yanomami Indians, on Brazil's northern border with Venezuela. A few years ago Possuelo yanked 22 men on a FUNAI expedition by helicopter from the Peruvian border after they were surrounded by hostile, isolated Indians. This time he has assembled a large, well-armed contingent; the Flecheiros would have to think twice before attacking such a numerous force. But Possuelo has issued standing orders: If we are attacked, the men are only to fire warning shots in the air.

From the very moment I met Possuelo, I found him to be a man of boundless energy. Photographer Nicolas Reynard and I had joined him aboard the *Waika*, one of four vintage Amazonian steamers that was hauling us upstream toward the Itaquai's headwaters. He barked orders to the men while amiably fielding my questions without skipping a beat. Once we left the boats behind, we would spend nearly a month marching straight through the heart of unknown territory, he told me that first night. Eventually we would build our own dug-out canoes to navigate down the Jutai and back to civilization.

Our route would take us through the



Bloated and beginning to decompose, an anaconda emits an awful stench on the banks of the Curuena River but offers few clues about who killed it. Another local puzzle: How to evict a handful of non-Indian settlers who illegally remain in the Javari reserve. Possuelo wants the settlers out, but his critics say development of the Amazon Basin is as natural as a downpour in the rain forest (below)—and almost as inevitable.



ISOLATED TRIBES WILLING TO KILL INTRUDERS TO DEFEND THEIR LANDS MAKE THE MOST TENACIOUS GUARDIANS OF THE PRISTINE FOREST.

southernmost reaches of the Javari reserve, a vast wilderness area set aside by FUNAI in 1996, the year government agents under Possuelo's command expelled all non-Indian settlers and loggers from the territory. Picture the southern half of Florida, roughly the same size as the reserve, in pre-Columbian times: not a single road, a mere 3,900 inhabitants spread out over an enormous expanse of steamy woodlands, swamps, and alligator-infested rivers.

In fact, southern Florida 500 years ago hosted a much larger population than that, and ethnologists say it's certain the Javari drainage itself once did too. Archaeologists estimate that millions of indigenous people occupied the Brazilian Amazon at the beginning of the 16th century. Today there are some 350,000 in all of Brazil, including isolated groups like the Flecheiros whose numbers, along with many other

things about them, are a matter of guesswork.

Not even Possuelo knows what language the Flecheiros speak, what their ethnicity is, or even what they call themselves. "It's not important to know any of that to protect them," he says. And anyway, it would be impossible to glean such information without exposing the Indians to deadly disease or a host of competing values that could erase their traditions. "Once you make contact, you begin the process of destroying their universe."

Possuelo didn't always think this way. Like other sertanistas, he once thrived on the excitement of contacting "wild" Indians. A FUNAI scout's professional reputation was built largely on how many first contacts he had notched. In all, Possuelo has been credited with seven since the 1970s. But in the course of making those contacts, Possuelo became disillusioned. The

"YOU WERE **BORN**
AGAIN TODAY, BECAUSE THE
FLECHEIROS COULD HAVE KILLED
YOU," POSSUELO **SCOLDS.**



Their mission accomplished, Possuelo and company build their own canoes to carry them home. Using axes and machetes, they fell two large trees, then strip the bark off each trunk (top left). Drilling an array of shallow holes on the bottom of a log (middle) guides work on the top side; the men hollow out the wood until they hit the holes, which ensures the canoe's hull has a uniform thickness. Later the holes are plugged. Roasting the hull over a fire (above) makes the wood malleable, enabling workers to pry the hull open wider—then jam wooden slats inside. Two weeks later the canoe is river ready (left), and the team is primed to push on.



Indians began to visit the rough-and-tumble frontier towns, started drinking, and lost all sense of who they were. To meet new needs and wants created by the dominant white society, such as clothing, medicine, and consumer goods, they began selling off timber, despoiling their land in the process.

Possuelo eventually came to see contact as the undoing of once proud indigenous societies. “The curiosity I once had about uncontacted people has been subordinated by something else—the imperative to protect them.”

Possuelo’s last contact with an isolated tribe came with a group of Korubo in 1996, also within the bounds of the Javari reserve (see page 24). But he undertook that initiative, he says, only to save the Korubo from increasingly violent clashes with logging crews. This position has

placed Possuelo at loggerheads with a broad array of adversaries, including missionaries who, he says, have accused him of playing God with the Indians while shielding them from pastoral efforts to spread the Gospel and the word of everlasting life.

BUT NOW OUR OWN LIVES

are at stake. Possuelo dispatches a second team, a dozen fully armed scouts, to look for the Kanamari and the missing Matis search party. One of our scouts finally returns with disquieting news. The tracks of our missing companions led straight past the Flecheiros gate—the broken sapling on the trail—then followed the path through a huge garden of cultivated manioc and plantains and into the clearing of a large Flecheiros settlement, about 14 huts in all.



"I'm not proposing we should all get naked and be Neandertals," says Possuelo, at left, paddling down the Jutai River and against the popular tide. "But we can live a simpler life—one that might take us away from a materialism that destroys our air, our water, and each other."



Long hidden from modernity's gaze, a man from the Tsohom Djapá tribe (below) was first contacted three years ago by Kanamari Indians, who are believed to have lured some members of the Tsohom Djapá into servitude. Collisions with outsiders have been catastrophic for isolated peoples, says Possuelo, who sees gold dredges bordering Indian lands (right) as yet another shadow ahead. "Uncontacted Indians live in a lost paradise," he says. "I'm just giving them some time."



POSSUELO IS SURE THAT ONCE YOU MAKE CONTACT WITH THE INDIANS, YOU BEGIN THE PROCESS OF DESTROYING THEIR UNIVERSE.

The Flecheiros themselves had fled into the surrounding jungle, leaving behind prodigious heaps of smoked meats—monkey, tapir, turtle—and smoldering campfires.

"It's their system of security," Possuelo nods gravely. "They scatter into the forest."

The Flecheiros seemed to have been preparing for a feast, the scout reports. In the middle of the village, the scouts found several ceremonial masks made from long strands of bark, alongside ceramic vats filled with red urucú dye used to decorate faces and bodies. More ominously, the Indians took all of their weapons with them when they fled. But they left behind a sharp bamboo arrowpoint and the broken end of a blowgun, which the scout now holds aloft for all to see.

We thus learn for the first time that the Flecheiros have other weapons besides the bow

and arrow. And they also left two large clay pots brimming with curare, the dark poisonous goop that they apply to their arrow tips. Most disturbing of all, the Kanamari's footprints vanished without a trace down a path on the far side of the village.

Now Ivan Arapa silently demonstrates, covering his mouth with one hand and drawing an imaginary vine around his neck with the other, how the Flecheiros could have jumped our companions from behind, gagging them and yanking them off their feet into the undergrowth.

"I'd say they've been taken by the Indians," Possuelo says. "Now we have to get out of here. Maybe the Indians will let them go." He looks out into the shadowy forest surrounding us. "But we can't wait for them here," he adds. "We're going to march to a more advantageous position. We'll camp by the river and see if they show up."



Soldado's rifle did they realize they were not being chased by the Flecheiros.

Possuelo seizes the occasion to call a kind of political pep rally around the campfire. "I'd say to our two Kanamari friends: You were born again today, because the Flecheiros could have killed you," he mildly scolds. "We're not here to get to know them. We're here to find out if the Flecheiros use this land."

Possuelo then reminds the Indians of the extraordinary things they saw today. Their incursion into the Flecheiros village amounted to a flagrant violation of Possuelo's policy to avoid making contact. Nonetheless, he is clearly elated by what he has learned from the unlikely visit.

"Here the Flecheiros live well," he says in slow, simple

By now both search parties have come back, leaving only the two Kanamari unaccounted for. One of our lead scouts reports seeing footprints that match the Kanamari's rubber-soled sneakers farther ahead, spaced out in long intervals that would suggest the strides of men in panicked flight. Possuelo dispatches Soldado, his most dependable scout, with orders to overtake our fleeing companions and, if necessary, fire into the air to summon them.

Possuelo clamps his hands together as if beseeching God. But it is still another hour before Soldado and the two wayward Kanamari appear at the edge of the riverside clearing where we are preparing our campsite. The Kanamari bow their heads contritely as Possuelo glowers at them. But clearly he is more relieved than angry at the men.

It seems the two Kanamari thought the Flecheiros might be long-lost relatives separated from the main riverside settlements decades ago. They admit they ignored Possuelo's orders and ventured off to satisfy their curiosity. But fear washed over them when they got to the far side of the village. They leaped off the trail and took off running. Not until they heard the report of

Portuguese, making sure his words sink in. "You could see it in their village. They hunt, they fish, and they grow food. They must be very healthy. Their babies must be fat; their mothers probably have lots of milk. They have parties. They are happy."

The last traces of daylight have faded from the sky, plunging the jungle into darkness. Luminescent moths zip through the trees overhead, and the nighttime chorus of trilling insects and croaking frogs has begun.

"The work we are doing here is beautiful, because they don't even know we're here to help them," Possuelo says. "We have to respect their way of life. We're not going to pursue them. The best thing we can do is to stay out of their lives."

Possuelo pauses to stare into the flames of the campfire. "Now we're going to continue our work and our journey," he says. "We're all going to get out of here alive."

WEBSITE EXCLUSIVE

Experience the Sights & Sounds of the Flecheiros expedition, then view images of first contact with the Korubo people. Join our Forum and share your thoughts on the future of isolated tribes at nationalgeographic.com/0308.

AFTER FIRST CONTACT

ONCE HOSTILE TO THE OUTSIDE WORLD, A BAND OF KORUBO—KNOWN LOCALLY AS THE HEAD BASHERS—ACCEPTED PEACEFUL CONTACT IN 1996. WHAT'S HAPPENED TO THEM SINCE?

Only five days after first being contacted by a team from FUNAI, the Brazilian government's Indian agency, a Korubo hunter named Takpan is all smiles as he shows off the carcass of a paca, prized game in the Amazon. Ten months later, however, the same hunter would slay one of the FUNAI team's most experienced hands. The attack came in the traditional Korubo way, by surprising the victim with a skull-crunching blow from a heavy club.

Following the assault by Takpan, the Korubo



vanished into the jungle for four months. When the band reappeared, a FUNAI worker who had witnessed the killing asked for an explanation. “What killing? We didn’t kill anyone,” Takpan replied. Had it been a ritual slaying? Did the victim commit some offense? Even now the reasons for the killing remain enigmatic.

Only threads of Korubo history are known: Sometime in the early 1990s a band of about 20 Korubo split from a tribe of several hundred living deeper in the forest, forcing the splinter

group closer to “white man” territory. Subsequent skirmishes between the band and settlers and loggers prompted FUNAI to intervene, despite the government’s official hands-off policy toward uncontacted peoples. Today the Korubo regularly visit a nearby post for medicine and to report trespassing by outsiders into the Vale do Javari Indigenous Area where they live. In four encounters, the Korubo have chosen to fight before reporting. Three interlopers have been killed and three others wounded.



On one of his periodic visits FUNAI expedition leader Sydney Possuelo (above) checks in with the Korubo band he first contacted in 1996. The band's number has remained constant since then. The only deaths have been those of children: An anaconda attacked one youngster while the group was bathing, and there have been three infanticides, a not uncommon practice among Amazonian tribes. Korubo mothers speak openly of the babies, who were all female, but do not say how or why they were killed—

another Korubo mystery. The band inhabits a large range, dividing time among their *molocais*, or communal shelters, which serve as bases for hunting, fishing, and farming of manioc, plantains, and maize. Both men and women paint their bodies with a red dye made from the seeds of the urucú tree. But outsiders know little about Korubo social structure or beliefs—which is just fine with Possuelo if it helps protect the band's isolation. □

Valerie A. May, Senior Editor



Linked by trust and curiosity, Possuelo and a woman named Maya share a joyful moment (below). A dispute involving Maya may have been the reason why these Korubo broke from the larger tribe. Regular visits by FUNAI workers such as Antonio de Souza Olivera (below left), who administers antimalaria medicine to a child, are part of a strategy of limited interaction that seems to be working well for the Korubo—for now.





By Cathy Newman
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by William Albert Allard
NATIONAL GEOGRAPHIC PHOTOGRAPHER



bohemian rhapsody

paris

on the right bank of

history and hip embrace in **the marais**

IF A POLICEMAN EVER ARRESTS HER and tries to confiscate her barrel organ (as happened to a fellow street musician), Dominique Alavoine knows exactly what to do.

"I'll tie myself to it first," she says, her dark eyes flashing.

The coast is clear this afternoon, so Dominique, who is thin, angular, and has the hollow-eyed look of an Edith Piaf, begins peeling out "Lili Marlene" under the arcades of the Place des Vosges, a 17th-century square of perfect symmetry in the heart of the Marais.

The Marais, a 310-acre triangular slice of Paris on the Right Bank of the Seine, is a kind of outdoor cabaret, anyway. The narrow, vibrant streets of this neighborhood make a perfect stage for Dominique and her music.

"You can reach people through a song," she says. "You create a rapport; it's almost angelic."

After playing in front of the Place des Vosges, she wheels her barrel organ down the Rue St. Antoine and wrestles it up the steps leading to the plaza in front of the Church of St. Gervais-St. Protais. Slipping the punch cards of a tune into the organ, she turns the crank and plays "When I'm Sixty-four," singing in a clear soprano in French-inflected English.

*When I get older losing my hair,
Many years from now.*

An old woman, her hair twisted in a pewter bun, opens her heavy wooden shutters three stories up, peers down, and sways to the music.

*Will you still be sending me a valentine,
Birthday greetings, bottle of wine?*





Graceful geometry of the Place des Vosges is the legacy of Henry IV, who envisioned a public space lined by shops and homes. "It's a little melancholy with the noise and crowds," says resident Claude de Muzac, whose apartment faces the 17th-century square. "Even so, when it has rained and the grass glistens, it's magic."

place des **vosges**





A sun shower bathes the Rue de Rivoli in light the color of pale champagne. The Marais—a fable of a neighborhood's rise and fall and rise—was chic in the 17th century, declined into slum in the 19th, then turned newly chic in the late 20th.

rue de rivoli



A door to an apartment next to the church swings open; two men emerge, bottles in hand, and pass glasses of Chablis around. Early afternoon strollers cluster around the barrel organ, gratefully accept, and begin sipping. It is as if the music unlocks something in each person's soul, opening them to the world and to others.

"This is how I met the man in my life," Dominique says. "He came every day to listen to me play. I found I could talk to him about anything." He was, it turned out, a musician as well.

"Life is full of surprises," she says in a tone of wonder. "No, not a surprise." She smiles. "It was the magic of the street."

Perhaps I should get a barrel organ myself, I suggest, swayed by the romance of the story.

"Here," says Dominique, motioning me to her side. "Would you like to try?"

She inserts a roll of music in the organ, and, as I crank the handle, wavering notes shape themselves into "Some Day My Prince Will Come."

In the Marais enchantment seeps up from the cobblestones, wraps around the wrought iron lampposts, suffuses the narrow alleys. You walk down a street, and a vendor conjures a bouquet of pink roses. Behind the stiff facade of a 17th-century building lies a garden

Life imitates art in the Picasso Museum, housed in a restored 17th-century mansion. In 1965 the French government passed a law making the Marais a historic district, thus preserving mansions once on the edge of decay.

drenched in the fragrance of lilacs. Then there is the Place des Vosges—with nine nearly identical mansions on each of the four sides, except for the grander King's and Queen's Pavilions, which anchor the southern and northern sides. In the soft morning light, the brick blushes faint pink. Linden trees pruned into a perfect geometry border a garden, which stands as the centerpiece of the square. Lovers lie on the grass, entangled in each other's arms. Why *shouldn't* a prince appear?

The history of the Marais (which translates as the "marsh") is a riches-to-rags-to-riches fable that began in the 1600s when Henry IV built the Place des Vosges, making it the most fashionable address in the realm. Almost two centuries later it started a gradual descent into slum, serving also as the Jewish ghetto (by custom, rather than law). Only recently has it emerged from the grime to become, if not the highest rent district in Paris, then certainly one of the most chic

street scene

The neighborhood's haphazard web of narrow streets includes those that still follow their medieval courses.



Church of St. Gervais-St. Protais

Picasso Museum



ILLUSTRATION DOMINIQUE DUPLANTIER, GUIDES GALLIMARD PARIS, EDITIONS NOUVEAUX LOISIRS, FRANCE

0 ft 400
0 m 100
NG MAPS



addresses in this capital of chic. Call such transformation magic if you will. Better yet, shrug as the French do and accept it as part of the ineffable sweetness of life.

There is a grandeur to parts of the Marais, with its 17th-century mansions built when the quarter was ultrafashionable, but on the whole the Marais is not grand. There are more extravagant neighborhoods in Paris: the 16th, for example, a tony arrondissement, or district, of art nouveau and art deco apartments, where the

Within 40 steps you pass a synagogue, a kosher butcher, two gay bars, and an Internet café.

women carry quilted Chanel bags, shop for their clothes in Franck & Fils, and dress their children in navy blue and bottle green.

The Marais—which incorporates most of the 3rd and 4th arrondissements of Paris—is not at all like that. In fact, once you cross the Rue de Bretagne into the northern apex of the Marais triangle, the neighborhood turns quiet and ever so slightly frayed.

The Marais—chic and not-so-chic sections

alike—is quirky. The 16th- and 17th-century buildings lean over the streets as if slightly tipsy; narrow lanes turn and twist and bear strange names like Rue du Pont aux Choux (the Street of the Bridge of Cabbages) or Rue des Mauvais Garçons (the Street of Bad Boys), named after the criminals who lived there in the 14th century. The Marais, says Jacob Berger, a film director who lives and works in the neighborhood, is *de guingois*—that is to say, slightly askew. Many who live there are too.

Meet Fabien Douillard, professional dandy, who, one morning after watching the film *Titanic*, arose and decided he was not of this century. Subsequently, he began to sleep in a grand *lit à baldaquin*, or four-poster bed. He wakes each morning to the baroque strains of the 17th-century composer Lully and dresses in tailcoat and top hat. Then he heads to one of the more elegant tearooms in Paris, Mariage Frères, where he sits writing poetry in a book of vellum leaves bound in brocade. Sometimes he works a day job in a shop that specializes in the restoration of antique textiles. If the truth be known, he also owns a television set kept hidden in an antique cupboard. But for the most part he lives his dreams of centuries past.

“How will we recognize you?” my interpreter,



From generation to generation, brides like Melanie Hadjadj have been married in the Synagogue des Tournelles. Bouquets of sorrow at 6-10 Rue des Hospitalières—St. Gervais commemorates the 165 students of a Jewish school who were deported and murdered during the Nazi occupation of Paris.

Elisabeth, asks when phoning to set up the interview, as if there might possibly be more than one man in top hat and tails lunching in Mariage Frères.

“I’ll be the one with the ostrich fan,” he replies.

Cross a street in the Marais and you cross centuries and cultures. Such is the richness of the neighborhood that within 40 steps on the Rue des Ecouffles, you pass a synagogue, a kosher butcher, two gay bars, and an Internet café. The Rue des Ecouffles dead-ends into the Rue des Rosiers, the spine of the Jewish quarter, where you find restaurants that sell kosher pizza, kosher Chinese food, and kosher sushi—prepared, a notice on the door proclaims, according to strict supervisory laws. There are posters trumpeting a cross-dressers’ ball and a performance by

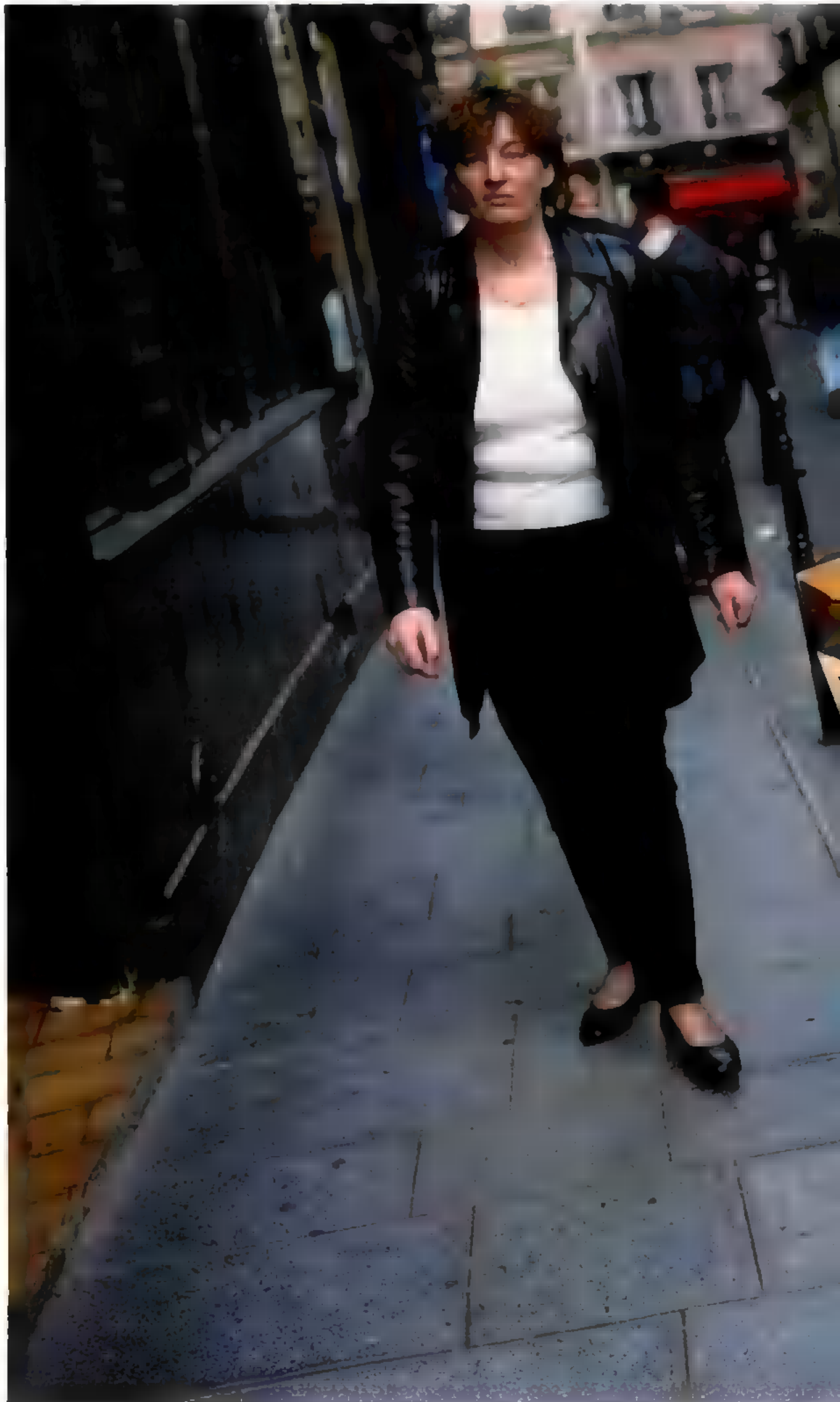
Madame H. (who is really a satirist in drag named Christophe) at the Point Virgule, a small theater. In the Marais, cultures, sometimes even genders, blur: It’s strictly live and let live.

But at Jo Goldenberg’s, Korcarz, or any of the other Jewish bakeries or delicatessens, tradition rules. There is strudel with apples, cinnamon, and nuts; cheesecake dense with raisins, cherries, or strawberries; poppy seed cake, bagels twisted like a wreath and dusted with sesame seeds, Russian bread dark as molasses, borscht, pickled herring, and more, much more.

“People come here to taste their roots,” says Florence Finkelsztajn, who runs a bakery at 19 Rue des Rosiers. But there’s more to it than just cheesecake, she points out. It has to do with making connections. “The Jewish community lives split up, so it’s important to have a place to meet,” she says, referring to the movement of most of the Jewish population to outlying arrondissements and the suburbs in the decades following World War II. It also has to do with celebration. “We cater for all occasions of happiness—marriages, bar mitzvahs, brisses.” It has to do with continuity. “Our customers stay with us from generation to generation.”

Do not confuse the Finkelsztajn’s at 19 Rue des Rosiers, owned by Florence, with the

A flash flood of tourists and locals streams down the Rue Ste. Croix de la Bretonnerie in pursuit of life, liberty, and a good time. In the tolerant Marais, races, cultures, and genders mix and match. Laissez-faire prevails: There is something—and someone—for everyone.



rue ste. croix de la bretonnerie





Finkelsztajn's at 27 Rue des Rosiers, owned by Florence's ex-husband, Sacha. Florence Finkelsztajn's, which has a blue mosaic front, is closed on Tuesdays. Sacha Finkelsztajn's, which has a yellow painted front and awning, is closed on Wednesdays. In a kind of friendly rivalry, both sell pastries and savories like grandmother used to make.

Which of the bakeries has better strudel?

"Here," Florence says, setting a plate in front of me. "You decide."

In the Marais, along with sweetness, there is bitterness too deep for words. The history of its Jewish community, which dates from the 13th century, is a litany of forced dispersals, including a great, forced expulsion in 1394. The community virtually disappeared and would not be reborn until the 19th century, when large numbers of Ashkenazi Jews immigrated to Paris from central Europe. (In the 1960s an influx of Sephardic Jews from North Africa arrived, adding their cultural influence to the mix. Today in the Jewish Marais a mixed marriage is not the joining of Christian and Jew, but rather the pairing of Sephardic bride and Ashkenazi groom.)

The darkest night was yet to come. On June

14, 1940, the Nazis occupied Paris. "I was two years old when my father was deported to the death camps," says Lina Zajac-Dratkowski. "Though it was more than half a century ago, the pain gets worse as I get older."

She is sparrowlike, now 62, and fierce. "I can't forgive; to forget is impossible," she says. "My uncle, my aunts, my cousins, my father—all lost."

I murmur something about the horrors of the Nazi occupiers and the random nature of the deportations.

"It's not the Germans who came and took him," she says sharply. She's referring to France's wartime Vichy government, which rounded up and sent 76,000 Jews to French transit camps before shipping them to Auschwitz and other German concentration camps. "My mother was philosophical. She used to say: 'This country accepted us; we must respect it.'"

Lina opens her purse, pulls out a wallet, and extracts a small square photograph, darkened with age.

"This is all I know of my father," she says, handing me a photo of a young man with round brown eyes and a look of innocence.

"I never watch documentaries about the war," she says quietly. "I'm terrified I'll see my



Passions dwell in shadows in the *Bistro Latin* (left), a dance hall on the Rue du Temple, and in *Les Scandaleuses*, a lesbian bar on the Rue des Rosiers. As bars, boutiques, and other beacons of the trendy increase, so does regret. "This was a village," said a resident. "Now it's deformed by money."

father on the deportation train or as one of the skeletons.

"No," she repeats, lips drawn into a thin line, "I haven't seen the films. I know how they end."

Today the Marais teaches tolerance. "The Marais opens minds," Hervé Lourau, a judge, tells me over a drink. Lourau, who lives on the outskirts of Paris, comes to the Marais to socialize. "Here gay life is so open. People come and decide 'they' aren't monsters, after all."

Lourau credits the gay community with generating much of the energy and style that have made today's Marais a trendy place.

"I hate to be a gay imperialist," he says, "but gays are always ahead of the fashion curve; that's how the Marais became fashionable." He surveys the room. "Some people come with their

families, sit in a gay bar, look around, and suddenly realize there are a lot of boys. Of course," he adds, "some people never notice anything. They don't get it."

In the Marais there are 370 gay businesses, according to Jean François Chassagne, president of the Syndicat National des Entreprises Gaies, an association of gay businesses.

"The Marais is the shop window for the gay community," says Chassagne, a resident of the quarter. There are gay restaurants like *Le Gai Moulin*. There are cruising clubs for gay men like *Le Dépôt*. There is *Le Gay Choc*, a bakery, where one can order loaves of bread in, shall we say, unusual shapes. There are gay bars like *Le Cox*, the *Bear's Den*, *Amnesia*, and the lesbian bar *Les Scandaleuses*, and many of these enterprises fly the rainbow flag of gay pride.

Does the flag signify that only gays are welcomed and others not? I ask.

"*Mais, non*," Chassagne tells me. "We're not heterophobic."

The Marais wasn't always ahead of the curve. By the end of the French Revolution it had fallen behind. The path to faded glory began in 1682 when Louis XIV moved the court from Paris to Versailles, ten miles west of the city limits. In the following decades nobility drifted away

from the Marais and toward the west side of Paris, nearer the focal point of power. The Marais became, said Louis-Sébastien Mercier, an 18th-century writer, “the refuge of families in decline.”

As the wealthy moved out, industry moved in. The area became a place of small manufacturers, workshops, and craftsmen, who set up shop in the courtyards of dilapidated mansions.


By 1950 the Marais had more substandard housing than any other part of Paris. The whiff of urban decay floated through the quarter. A third of the buildings lacked running water. Two-thirds of the units lacked private toilets.

“In the 1960s a friend asked a taxi at Orly Airport to take her to the Place des Vosges. The driver said: ‘Where is that?’” recalled historian Alexandre Gady, author of a guidebook about the Marais. If near oblivion wasn’t bad enough, the Marais became a junkyard. “Developers broke into houses and grabbed architectural elements—woodwork, wrought iron—whatever they could cart away.”

In 1965 the French government tucked the Marais under its wing and protected it under a law that proclaimed it a historic neighborhood.

In the classic scenario, developers moved in, rents soared, craftsmen and longtime residents were forced out. Renovation revived the area and launched the Era of Exposed Beams. The Marais became smart and perhaps a little too slick.

A neighborhood bakery became a glitzy



The Marais, says a film director, is *de guingois*, slightly askew. Many who live there are too.

shoe store. The butcher is now a fashion shop. The old Jewish bathhouse, or *hammam*, nearly became a McDonald’s—the developers even pledged to sell kosher hamburgers—until protesters quashed the move. Stores patronized by women wearing fashionably frayed jeans, impossibly high heels, and bored looks sell lava lamps, African baskets, and batik skirts.

“You walk along the street; you see shirt, shirt, dress, dress,” says Thérèse Bernardac, who owns the antiques shop Les Deux Orphelines in the Place des Vosges with her son, Edouard.

Do you feel like a dinosaur? I ask.

“Yes,” she sighs, looking around the shop

crowded with old porcelain and furniture. “It turns out *we* are the antiques.”

“Sundays are the worst,” she adds. “You have to cleave your way through tourists.”

“Without tourists and their credit cards, business in your store might languish,” I counter.

She lifts an eyebrow. “You can’t have everything,” she says with a faint smile. “But you *can* have regrets.”

I imagine a dusting of magic has fallen our way. A genie (with a Gauloise cigarette dangling from his lips) grants us a wish. We wish for an apartment in the Marais.

Fetch a copy of *Le Figaro*. Leaf through the classifieds and find our dream come true: the perfect pied-à-terre.

A few caveats. An ad with the words *rue animée* (lively street) means the street is so noisy you can’t hear yourself think. *Atypique* signals that the apartment is over-the-edge strange; perhaps the rooms are triangular in shape. *Coquet* (cute) is code for an apartment so small you can’t swing a cat in it. And *nous consulter* (price on request) hints that unless you have the resources of a sultanate, you can’t afford it.

Now, throw caution to the winds. Suppose you have experienced a *coup de foudre*—love at first sight—and you are irrevocably and desperately infatuated with the idea of buying an apartment, not just in the Marais, but in the Place des Vosges.

It so happens that Emmanuel de Poulpiquet, director of the Marais office of Daniel Feau, a high-end real estate agency in Paris, has a listing for an apartment in the Place des Vosges. We will get to the price tag later, but for now, let’s find out something about Paris real estate from an insider’s perspective.

De Poulpiquet sits behind his desk on the Rue de Turenne (not such a good street, he tells me) in a crisp white shirt, striped silk tie, and gray wool suit with a discreet plaid check; the glint of gold flashes from a ring inscribed with a crest.

“The Marais is difficult,” he informs me. “Narrow streets. No room to park the Mercedes. For

Elegantly eccentric, Fabien Douillard, an antique-textile restorer, has decided he prefers the 18th century—and now dresses accordingly. “For the moment,” he says, “it enriches my life.”



Pleasures ephemeral as smoke

drifting from a diner's lips, lasting as the stones of the Place des Vosges, give the Marais its style. To live here confers pride. Says a resident, "You walk through the Place des Vosges, see tourists and think: They're only visiting. I live here."

the French with big money, it's not so chic. They buy elsewhere—in the 16th, for example, not because it's historic, but because it's expensive.

"But," he says, warming to the topic, "we have *le bobo*." Bobo is shorthand for bourgeois bohemian, that subset of thirty- and forty-something-year-olds who don't allow their socialist leanings to interfere with an enjoyment of material pleasures. Bobos dress in retro-hippie-shabby-chic and shop for little Theo or Mathilde in shops like Petit Boy or Jacadi for such necessities as lime green slippers with sequins. They drive small cars and can be found eating lunch at Le Pain Quotidien, where everyone sits at long tables in a show of equalitarianism, but nobody talks to one another.

The Marais happens to be prime bobo territory, and de Poulpique knows the psychology of his potential clients like a sommelier knows his wines.

"Their mother and father came from smart addresses in the 6th, 7th, or 16th, but they want to be different," de Poulpique says. "They come to the Marais. They look. They like what they see, and in the afternoon the father comes to write the check."

Bobos would probably not be in the market for a Place des Vosges apartment—too expensive, even for them. But since I'm window-shopping and can afford to dream, I insist that de Poulpique show me the apartment. He is, it turns out, showing it to a client this afternoon and agrees to let me tag along.

The apartment has good bones and an impeccable pedigree. Carved out of the former home of a 17th-century duke, it's 2,300

square feet, with two bedrooms and two and a half baths.

Among its selling points is a master bedroom the size of a small theater, with silk fabric on the walls, a

WEBSITE EXCLUSIVE

See more of the enchanting Marais through the eye of photographer William Albert Allard's lens. Visit our photo gallery at nationalgeographic.com/ngm/0308.



waterfall of crystal chandeliers on the ceiling, and huge French windows that open up to a sweeping view of the square.

The price? Almost three and a half million dollars; when my eyebrows shoot up, he points out that anything similar in London would cost twice as much. It wouldn't be me, or that day's client, but sooner or later someone would fork out the equivalent in euros and enjoy a view once reserved for the nobility of France.

In the fairy tales the prince appears on cue; the glass slipper fits; the beautiful couple lives



happily ever after. As Dominique Alavoine knows, magic happens, unplanned, unexpected.

The Marais has had its share of magic. Rags to riches is the ultimate fairy tale. The slum becomes a palace; mice turn into bichons frises on dainty gold leashes. We want to believe the story ends there. Perhaps the next apartment in the Place des Vosges will sell for *five* million dollars. Perhaps the Era of Exposed Beams will last forever.

Then again, perhaps not. If a taste for truffles is replaced by a taste for *le Big Mac*; if the Marais turns into Disney World-on-the-Seine,

well, *c'est la vie*. "We must be kind to fashion, because it dies so young," observed the French writer Jean Cocteau. Even now, word has it, the neighborhood around the Rue Oberkampf, a former industrial area across town in the 11th arrondissement, has become the new hub of Paris cutting-edge cool.

Nothing stands still. The Marais—fashionable in the 17th century, unfashionable in the 18th century, downright slummy in the 19th, now newly chic—could lose its luster once more. After all, forever-after is only for fairy tales. □




Sketched into Cerro Uchita by unknown artisans millennia ago, El Gigante—a 282-foot-tall geoglyph—bears witness to humanity's determination to wring life from desiccation.



THE DRIEST PLACE ON EARTH

IN CHILE'S ATACAMA DESERT
THE DEAD LIVE FOREVER,
AND HOPE NEVER DIES.



A dramatic landscape photograph showing a volcanic field. The scene is dominated by a massive, billowing plume of white and grey smoke or ash that rises from the ground, filling the upper two-thirds of the frame. The plume has a textured, turbulent appearance. Below the smoke, a dark, rocky terrain is visible, which is the volcanic field. In the lower right foreground, a small, dark silhouette of a person stands on the ground, looking towards the volcanic activity. The overall lighting is dim, with the primary light source being the smoke itself, which creates a hazy, atmospheric glow. The colors are muted, with greys, whites, and dark browns/black tones.

*Hot breath of active volcanoes rises from Polloquere—
a roiling field of thermal pools—recalling the fiery
forces that started the Andes heaving skyward some
50 million years ago. The range is still rising about an
inch each century.*



DESERT
ADVENTURE



It may look like a one-horse town, but San Pedro de Atacama hosts swarms of tourists. Most come on desert excursions; a museum housing thousand-year-old mummies is the other main draw.



BY PRIIT J. VESILIND • PHOTOGRAPHS BY JOEL SARTORE

The child sits upright, knees bent, wearing woolen garments and a black, four-pointed, finely woven hat topped with a small feather. Alongside lie a basket of small corn-cobs, a knotted string bag, and a grub hoe carved from a llama jawbone. Brown braided hair peeks out from behind a metal mask that was meant to ward off evil spirits in the afterlife.

Before archaeologists discovered this tiny corpse in 1985, the Atacama Desert sun had baked its exposed tomb for more than 500 years. The mummy—one of several hundred that have been discovered along the Chilean coast—is part of a culture squeezed between the Pacific and the Andes that once scratched out life in a land where life simply shouldn't exist.

Stretching 600 miles from Peru's southern border into northern Chile, the Atacama Desert rises from a thin coastal shelf to the *pampas*—virtually lifeless plains that dip down to river gorges layered with mineral sediments from the Andes. The pampas bevel up to the altiplano, the foothills of the Andes, where alluvial salt

pans give way to lofty white-capped volcanoes that march along the continental divide, reaching 20,000 feet.

At its center, a place climatologists call absolute desert, the Atacama is known as the driest place on Earth. There are sterile, intimidating stretches where rain has never been recorded, at least as long as humans have measured it. You won't see a blade of grass or cactus stump, not a lizard, not a gnat. But you will see the remains of most everything left behind. The desert may be a heartless killer, but it's a sympathetic conservator. Without moisture, nothing rots. Everything turns into artifacts. Even little children.

It is a shock then to learn that more than a million people live in the Atacama today. They crowd into coastal cities, mining compounds, fishing villages, and oasis towns. International teams of astronomers—perched in observatories on the Atacama's coastal range—probe the cosmos through perfectly clear skies. Determined farmers in the far north grow olives, tomatoes, and cucumbers with drip-irrigation systems, culling scarce water from aquifers. In

Ocean gusts keep a paraglider aloft above Cerro Dragón, a desert dune looming over the coastal city of Iquique. The Atacama, edging northern Chile for some 600 miles, lies between the ocean and the Andes—bookends ensuring an arid climate. A high-pressure cell over the Pacific holds back moisture from the west, while the mountains block storms from the east. On average only half an inch of rain falls each year, and in some mid-desert spots it has never been recorded, creating vast wastelands. Water scarcity affects long-rooted tribes and city dwellers alike as demand, spurred by recent economic development, outpaces the meager supply.

the altiplano, the descendants of the region's pre-Columbian natives (mostly Aymara and Atacama Indians) herd llamas and alpacas and grow crops with water from snowmelt streams.

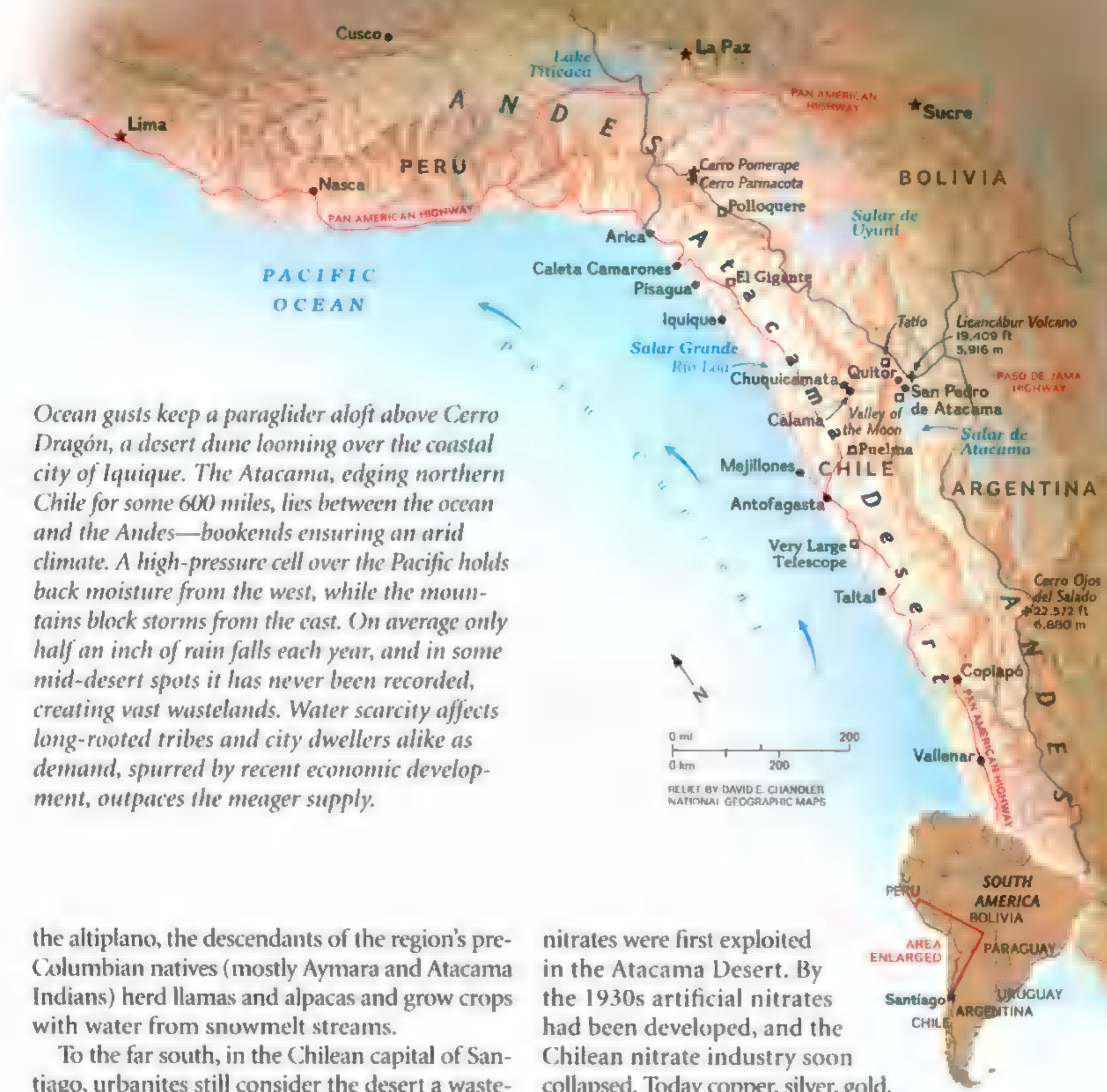
To the far south, in the Chilean capital of Santiago, urbanites still consider the desert a wasteland, impervious to environmental damage. Rumors persist that in the mid-1980s the government proposed creating a dumpsite for the world's nuclear wastes in the Atacama, but backtracked to avoid a public relations disaster. "There's a prejudice and lack of knowledge about the desert," complains Patricio Fischer, a biology teacher in Iquique, one of the northern cities. "People see the Atacama as a blank spot on the map."

That blank spot on the map—roughly covering the Chilean regions of El Norte Chico and El Norte Grande, or Little North and Big North—has been the unlikely engine of much of the nation's wealth for the past century, luring legions of ambitious workers to the area during a series of economic booms. Newcomers began to arrive in the late 1800s, when

nitrate were first exploited in the Atacama Desert. By the 1930s artificial nitrates had been developed, and the Chilean nitrate industry soon collapsed. Today copper, silver, gold, and iron mining drive the economy.

More recently the Atacama has become a popular destination for European ecotourists and Santiago's adventuresome elite, triggering yet another economic rush. In the Atacama's three largest coastal cities—Arica, Iquique, and Antofagasta—there are fancy shopping centers with bowling alleys and movie theaters. A glitzy beach scene materializes every summer in Arica, when hordes of vacationers arrive from landlocked Bolivia. Many come lugging golf clubs, intent on playing at one of three courses in the Atacama. Entrepreneurs have laid out fairways and greens in the sand: There's no grass, and swaths of blue paint on the rocks demark "water hazards."

Meanwhile, competing natural gas companies are bringing power to the Atacama's copper





SOUTHERN DISCOMFORT *The long arm of the law reaches the middle of nowhere in Chile, where wary police stop a visitor for speeding. Along such empty routes, crosses mark spots where drivers—perhaps lulled to sleep by the monotonous landscape—met their death.*

mines and sprouting cities. Pipelines draw fresh water from the Andes to the coast. A new highway, the Paso de Jama, now spans the mountains to connect Bolivia, Paraguay, Argentina, and Uruguay to the desert ports, which ship copper and other minerals to a growing Asian market.

With so much unchecked growth—urban expansion, modernization, the influx of new industry, and a burgeoning tourist trade—might there be a lasting, detrimental effect on a place many believe is infinitely resilient? Will the desert shrug off man's incursions, no worse for wear? To find out, I crisscross the Atacama for four weeks with Sergio Ballivian, my guide and translator, a Bolivian-born adventurer who relishes the Atacama's ruggedness. In a four-wheel-drive SUV we motor north to south from Arica to Vallenar, from the boisterous surf to the silence of the pampas, through the thin winds of the Andes, through a science fiction landscape. I want to learn how life survives, even thrives, where it should not.

Our journey begins as we drive south from Arica on Route 5, part of the Pan American Highway that bisects the Chilean desert. It's a road of ghosts, littered with the skeletons of wrecked vehicles and roadside shrines to crash victims adorned with crosses and plastic flowers. No villages here, no rancheros, no fences: only a few scruffy rest stops called *posadas*, collections of flat-roofed shacks huddled against each other. The mountains—which look as if they've been skinned, showing vein and sinew—break the eerie flatness.

More than 10,000 years ago, when the Atacama's climate was more moderate, humans started to populate the region. Archaeologists have long known about the desert's coastal civilizations, such as the Chinchorro, and have recently found evidence of human settlements in some of the Atacama's driest caves and valleys. Life could not exist at these inland sites today: An immense and permanent high-pressure cell over the Pacific Ocean fends off weather systems

from the west, and to the east Andean peaks drain moisture from clouds formed in the Amazon Basin. On the coast the cold-water Peru Current streams in from Antarctica and chills the desert air, creating a temperature inversion that further inhibits rain clouds.

The arid climate helped spur the desert's first period of industrial development. In the 1830s prospectors found surface deposits of caliche, a raw nitrate formed over millions of years. Without vegetation to absorb it or rainfall to flush it away, the "white gold" encrusted much of the desert's surface. Nitrates were urgently needed in Europe to manufacture explosives and fertilizers. British and other European mining companies arrived with know-how, and by 1895 the nitrate trade to Europe was thriving, supplying Chile with more than half its income.

Soon thousands of workers were migrating to the Atacama's hundred-plus *oficinas salitreras* (nitrate collection and processing depots), built in the starkest, most inhospitable parts of the desert. The nitrate-era laborers were a mixture of immigrants, unskilled rural workers, and unemployed men from overcrowded Chilean cities. "One great-grandfather came from Liverpool. My other great-grandparents were Swiss Germans," says Patricio Fischer. "Atacama immigrants were mostly young, making a break with their homelands."

In the last half of the 19th century, stiff-upper-lipped and ambitious English mining engineers set up their enterprises in the desert and imposed a culture of time clocks, tennis courts, and Sunday suits on their managers. Ordinary laborers were treated less well: Bosses exercised nearly complete control of workers, who were often paid with tokens good only at the company store. The nitrate industry soon became fertile ground for new, radical concepts of class struggle and labor unions. When the industry bottomed out in the 1930s, thousands of laid-off workers headed south to the cities with anger in their hearts and communist ideology in their heads. It was back to the desert that many Chilean communists would, years later, be sent to die.

In 1970 the nation became the world's first to freely elect a Marxist leader, Salvador Allende. He tried to help the poor by redistributing farmland among rural workers and nationalizing key industries. But his efforts triggered nationwide strikes led by the business community and

well-to-do Chileans. Amid severe food shortages, Gen. Augusto Pinochet, a right-wing authoritarian, ousted Allende in a military coup on September 11, 1973. Pinochet's army took revenge on Allende supporters, casting a wide net to jail, exile, or execute tens of thousands.

Many of those who were exiled ended up in remote, throwaway locations such as Pisagua, one of the Atacama Desert's former nitrate-exporting ports. By the mid-1970s Pisagua was a concentration camp that ran out of jail space; the overflow of men were housed in a ruined fish-processing plant, and women were kept in the anterooms of a quaint old British theater.

The theater is still there today. I stop by shortly after we arrive in town and ask historian Catherine Saldaña Suárez, a bright, erudite woman, about the building's history. She says the rooms have been redecorated, the handwritten notes on the walls erased. "The mentality of Chileños is to fix things up. We don't want to remember how bad it was." But her eyes, shining darkly, betray her: "I think a lot," she says, "and there are some things I cannot forget."

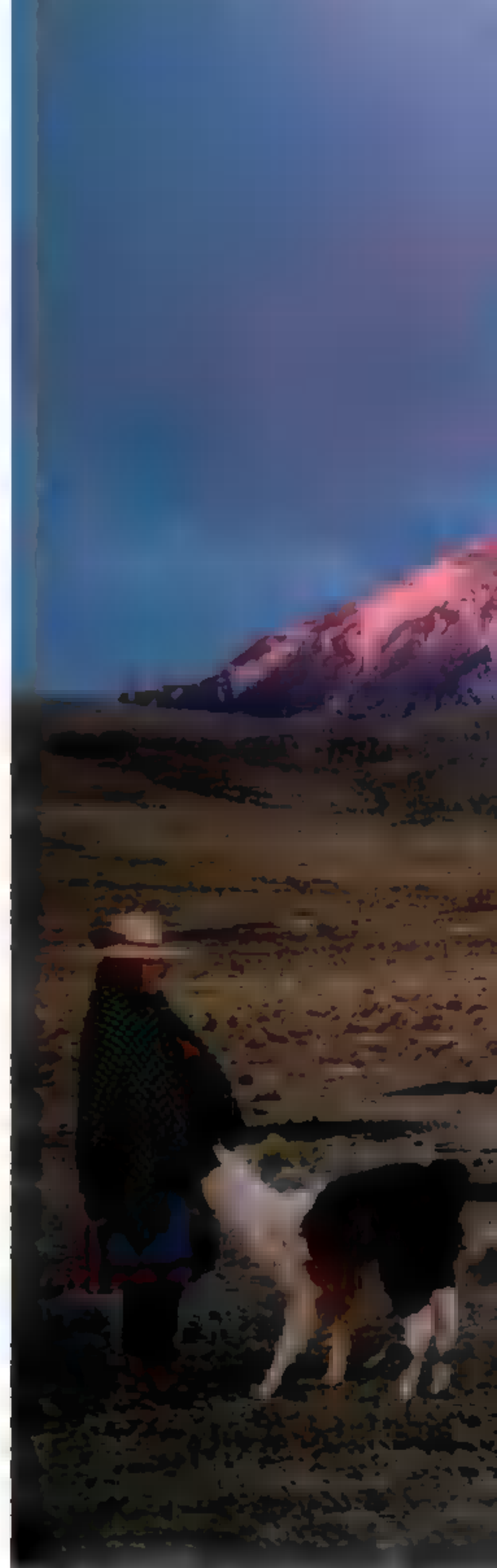
Pinochet left power in 1990. One of his prisons here is now a hotel, its cinder blocks painted red and blue. At the town pier I meet Oscar Romero Gallo, a portly fisherman with a wreath of black hair framing wire-rimmed glasses. He has just published a book on the history of Pisagua and says that when people arrived here after the coup they simply disappeared. "I have a feeling that many were killed and put into the sea," Romero says carefully. "How many? I don't know, and I will never know."

At Pisagua's cemetery by the sea, where the thunder of breakers might stifle a scream, a symbolic open pit and bronze marker commemorates 19 people found there, murdered by Pinochet's troops.

The road from Pisagua returns to the haunting loneliness of the pampas and their deep arroyos. Some water in the gorges still reaches the ocean during the peak snowmelt season. We follow one anemic stream to the coast, where the pastel plywood shacks of Caleta Camarones, a fishing village, simmer in the sun like a set from a spaghetti Western.

Eighteen families have lived in Caleta Camarones since the 1970s. To grow plants they use saline river water—brackish from flowing

AS LONG AS SNOWMELT CONTINUES TO FILL THE AQUIFERS, HUMANS CAN ENDURE IN THE ATACAMA.



over the desert's surface minerals. The grounds are littered with old nets, broken-down skiffs, and the hulks of cars that have succumbed to the rutted roads and sandstorms. The community's small fishing boats are anchored off a rugged beach, a five-minute walk from the village. Manuel Ardiles, a ruddy-faced fisherman with large, callused hands, isn't very optimistic about the future here. "I'd like to sell my boat because you really can't make money fishing anymore," he confides. "We want to start an aquaculture business here to grow abalone."

Fishing, the Atacama's second economic surge, began 20 years after nitrates went belly-up. Fish have always flourished along the Chilean coast because upwelling carries very cold water from the depths, bringing nutrients close to the surface where sunlight triggers profuse plankton growth that fattens up the fish. So between

1950 and 1980 thousands of unemployed nitrate miners found work on the sea.

Until 1994 the port city of Iquique stank and rattled with a dozen processing plants that reaped a gluttony of biomass—anchovies, sardines, jack mackerel, and sea bass. Nearly 90 percent of the catch was ground into meal, which became food for pigs, chickens, and other livestock.

Luis Torres Hernández, an administrator for Lidita canned seafood, offers us small cups of sweet coffee at his office in the port. Torres is a comfortable man wearing a Tommy Hilfiger shirt. "Iquique was the biggest fish-meal port in Chile, but fish meal is a predatory business," he tells me. "The plants were owned by international corporations that took anything and everything and put it through the grinder." By all accounts, the large fish-processing companies



LIVING THE HIGH LIFE *“They smiled knowing I’d buy a rug,” says photographer Joel Sartore. (He did.) Adapted to thin air, the Mamani family of the Aymara people (opposite) subsist as high-plains herders and farmers just as their ancestors did hundreds of years ago. Twin peaks Parinacota and Pomerape (above) tower over Aymara essentials: llamas raised for meat and wool.*

were not concerned with issues such as workers’ rights or the depletion of fish stocks. They came in, made their money, and left.

Climatic changes affected fishing as well. Six years ago El Niño, the warming of water temperatures, began driving pelagic fish from the coast. Then La Niña, a chilling of the waters, produced so much food that fish dispersed instead of traveling in schools.

When the heyday of fish-meal production ended, many workers drifted inland looking to snap up new jobs in the Atacama Desert’s copper-mining industry. All but two of the

seafood-processing plants are gone, but Iquique remains an important port city for trans-Pacific trade, and the fish-meal industry shows signs of reviving. And there’s still a frontier quality to the place: Strings of unkempt wooden row houses run up against the 2,000-foot-high sandstone bluffs that loom over the city. Bleached whale bones decorate street corners. At the same time, a glittering casino and a few high-rise resort hotels have sprung up. A paragliding outfit offers to strap adventurers on a tandem parachute, where they can soar like a condor in the updrafts for hours.

Small-scale fishermen remain in Iquique, unloading their eclectic catch—everything from tuna-like *cojinova* and cusk eels with brown splotches and slimy tapering bodies to sea bass and flounder—at the market dock each morning. It's here that I meet an old local fisherman named Santiago Cere. "There used to be a pier where you could just drop in your line and bring up fish bigger than this," he says, stretching his arms wide. "Albacore tuna were so plentiful that you could harpoon them." Cere swivels stiffly and braces himself, then with a pleased smile, whips his arm forward, harpooning the tuna of his dreams. "Whoosh! Whoosh!" he sings.

From Iquique we continue south along the coastal road, headed for a remarkable astronomical observatory perched in the nearby mountains. Pressure blasts snap our eardrums as semitrailer trucks whip past. The sea pounds against dark lava rocks, and the mountains flaunt mineral colors—maroons, blues, greens—that seem nearly organic.

Near the sea a dense fog called *camanchaca* flows thick. When the stable high-pressure cell offshore traps cool ocean air against the hillsides, the air condenses into low-lying clouds that float along the coast as fog. The *camanchaca* isn't wet enough to produce rainfall but does provide for an opportunistic ecosystem high



above the shore—moss-covered cactuses, a variety of shrubs, some rodents, and a few foxes—all thriving off the mist.

After six hours of driving we switch from the coastal highway to the inland Pan American, which climbs above the camanchaca's reach. The sky turns a soft blue as we veer onto a dirt road toward Cerro Paranal. Here, in a place where the air is utterly dry and clear, free from industrial pollution and city lights that obscure the heavens, a consortium of European nations has built the world's largest optical observatory and perhaps the most technologically advanced. Called, rather blandly, the Very Large Telescope (VLT), it consists of four telescopes, each fitted with a

specially designed mirror that feeds images to a central viewing station, offering astronomers an extraordinary window into deep space. Like Inca priests probing for cosmic favors, they've built their temple closest to the heavens, where they can decipher riddles of the universe under a full-starred sky more than 300 nights a year.

As we near the observatory, I can see its four shiny aluminum structures clustered atop an 8,645-foot summit. Security is tight. The safety officer ushers us along a ramp into the living quarters for 15 astronomers and some 100 support staff—cooks, chambermaids, engineers, maintenance men. It looks like a low-slung office building, its flat roof capped in the center with

At night, the VLT from space, showing the four telescopes and their central viewing station. The image is a composite of four images, each showing a different view of the observatory.



BLOWN AWAY Swirling winds kick up a huge dust devil near the Pan American Highway (right). Tourists are transfixed by the otherworldly terrain of the Valley of the Moon (below). "I'm an old woman looking for silence and peace," says 70-year-old Bruna Francini of Italy, at left, with a friend. "This lunar landscape left me breathless."



a white geodesic dome, but the door opens to reveal an indoor oasis, complete with lush tropical vegetation and a sparkling swimming pool. The entire compound is built into a sloping hillside to prevent ambient light from interfering with celestial observations.

Leaving the living quarters, we head toward the observatory. I'm breathing hard from the bite of the altitude as we ascend steel stairs to the catwalk that overlooks the tubular frame of one of the four telescopes in the array. The main mirror is seven inches thick and nearly 27 feet across, ground and polished to exacting standards. Sensors and pumps beneath it make corrections every 30 seconds, pushing and pulling the mirror like the springs of an orthopedic mattress. "We can shift its shape all the time, constantly looking for the best configuration," explains Esteban Illanes, an observatory spokesman.

In the control room astronomers plug coded rows of numbers into terminals. The figures govern the actions of the telescopes, which can be

positioned to observe any particular niche in the night sky. The VLT array digitally combines light entering all four of its telescopes into a single rendering to produce the highest resolution images of any observatory in the world. A British astronomer, Rachel Johnson, shows us dim but tantalizing images of an incomprehensibly remote region of stars, part of an Italian colleague's effort to determine a star's birth date by noting its color and brightness.

That night we drive off the mountain in utter darkness: Headlights are forbidden until we reach the main highway. Plummeting down to the coast, then north toward the city of Antofagasta, we take a wrong turn and fly over a two-foot-tall mound of dirt, landing in a shivering heap. After straightening out the radiator and changing a tire, we limp into the city.

Antofagasta, on the edge of the desert's vast expanse, is one of Chile's fastest growing cities. It's the center of the Chilean copper industry, and the world's largest copper port. An island between sea and desert, it's kept alive by caravans of dusty trucks, pricey water pipelines, and a railroad linked to the mines. The city has flexed from 183,000 people 20 years ago to a whopping 300,000 today.

"It was like a gold rush when mining jobs opened up in the late 1980s," says Luis Piñones Molina, the editor of *Estrella del Norte* (*Star of the North*), the local tabloid newspaper. "A mining driver could make \$2,000 a month compared with jobs that might bring in \$200 down south."

Inside the huge new shopping mall you can see Antofagasta's newly minted middle class pushing fancy new baby carriages, eating ice cream cones, checking out the newest computer gadgets, ordering Big Macs, and overextending new credit cards. "But the area doesn't particularly resonate with these people," says Piñones. "They don't put their money or their emotion into Antofagasta. They do their jobs here, then go home for the weekends."

Chile's copper wealth lies along the tectonic fault that lifted up the *Andes*. The ore is scraped from immense open-pit mines that sometimes



MINING DRIVES THE ECONOMY. BUT THE DESERT IS ALSO A PRIME DESTINATION FOR TOURISTS.



sully the desert's aquifers. But there are few organized protests. "The Río Loa, the most important river in the north, was contaminated by the Chuquicamata copper mine," says Patricio Fischer. "But the prime industrial base of the nation will not bend over for a few villages on a contaminated river."

At the port of Antofagasta, cathodes of corrugated copper plate are stacked like giant lasagna on wooden pallets. As a copper port, though, Antofagasta's days are numbered: In the next four years the government will shift much of Chile's copper shipments to a new deepwater port in Mejillones, 40 miles north, and leave Antofagasta as the administrative and commercial center of the region. Planners will transform the threadbare portion of the present port into an ambitious waterfront development on the order of those in Sydney or Barcelona.

Alvaro Fernández Slater, chief of the port, is a calm young man dressed in an earth-tone suit and tie. He hopes that the makeover will be a turning point, a coming-of-age for the city of Antofagasta and, by extension, the entire Atacama. "There's no real alternative for copper," he says. "We need to build our future now, while we have the money, improving the quality of life so people will make roots and stay. A lot of us came for one or two years and planned to go back to Santiago. But now I have a house, my children go to school here—they've become Antofagastans."

The state-owned Codelco-Chile company produces a third of the nation's copper. To visit the company's Chuquicamata open-pit mine—the largest in the world—we push inland toward Calama, its staging and



WORK AND PLAY *Miners masked against sun and cold carve up the land in search of borax (opposite). Although Chile has other mineral exports, copper has become king, accounting for nearly half the country's economy and a 20 percent rise in the desert population over the past ten years. At Club de Golf (above) near Arica, blue rocks signal a water hazard for die-hard players, who putt on grassless "greens" that are slathered with used motor oil.*

depot center. Calama is full of greenery and smells of money, but half the mine workers live in Chuquicamata, or "Chuqui," the company town tucked into a slope near a thousand-foot-tall, three-mile-long bluff of ore tailings. The expanse of the mine is beginning to overwhelm the town; discarded tailings are slowly burying the now abandoned Roy H. Glover Hospital, once one of the finest in South America.

In a radical move, Codelco-Chile is relocating the entire town—3,500 workers plus their families—to new housing projects in Calama. Miners living near the processing plants have

experienced severe health problems. But the official reason for the move is Codelco-Chile's desire to secure certification from the International Organization for Standardization (ISO). According to the ISO, conditions at the mine are safe for working, but laborers and their families live too close to the mine's production areas.

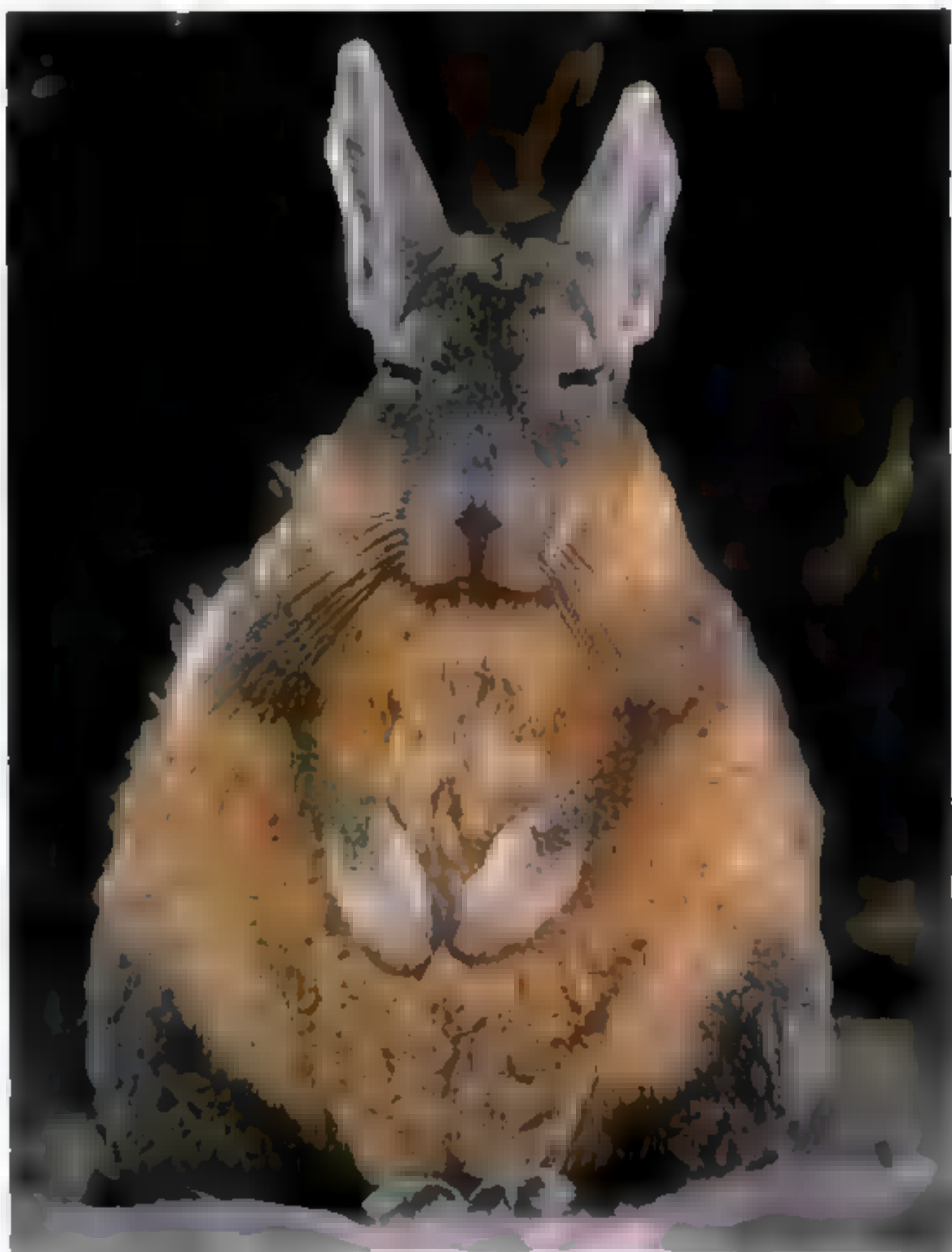
To find out how miners are faring, we drive from Calama to the union headquarters in Chuqui. The union president, Mirta Moreno Moreno, sits behind an overstuffed desk, wearing a brown suit, looking tired. Foreigners have seldom benefited her or her workers, so at first



Iron-red hills sculpted by wind dwarf the only road from Calama to San Pedro de Atacama. High above, the tower of Quitor—a restored pre-Columbian settlement—stands watch over a long-lost empire.



URBANITES CONSIDER THE REGION A WASTELAND, A BLANK SPOT ON THE MAP IMPERVIOUS TO HARM.



she fends off our questions with banalities. "There's arsenic and many other chemicals in the air," she says. "Every breath here can be hazardous. We have to be constantly monitoring the work conditions."

"But I've heard that the wages are the highest in Chile," I tell her.

She stiffens up, eyes flashing: "They may pay us with cash, but we pay with our lives. Practically none of our retirees have reached retirement age. They all leave after an accident or because of poor health. They don't get old; they go home to die. My father worked all his life here. He was only 54 and suffering from pulmonary silicosis. After watching him die, I decided to focus my energies where my heart took me—the health issues of workers."

Before leaving, we tour the mine and processing plants. From the rim of the pit it's hard

to fathom distance: The copper mine is a series of terraces three miles across and a mile deep. But my eyes insist otherwise until I see the speck of a 50-foot-tall dump truck—looking like a lost roach—crawl across one of the levels, hauling 360 tons of ore to the edge of the pit.

The road from Calama to San Pedro de Atacama, the tourist center of northern Chile, slants through the desert haze, with snowcapped volcanoes floating behind the lower hills like stage drapery. Here are the rock-strewn badlands where Nomad, a semi-autonomous rover vehicle designed by U.S. scientists for Mars, trained in 1997 for its upcoming mission. And just last spring scientists from Carnegie Mellon University, the University of Tennessee, Chile, and NASA visited the Salar Grande—a region of the Atacama with





DESERT DWELLERS *Lush fur and suspicious eyes defy the Atacama's reputation as a lifeless void. In the south, dense coastal fog called camanchaca nourishes scrub, columnar cactuses, and creatures such as the gray fox (above). At a higher and drier altitude, a herbivorous viscacha (opposite)—a close relative of the chinchilla hunted for meat and fur—puffs up against sharp desert cold.*

a startling resemblance to the red planet—to begin developing a robot that will search for signs of life elsewhere in our solar system.

The Atacama's extraterrestrial likeness is helping to attract an increasing number of tourists, Europeans in the Chilean summer season, urbanites from Santiago in winter. We cross the sere basin known as the Plain of Patience, where the desert shimmers with pastel layers of gypsum, clay, and minerals, and the geologic weirdness of salt-rock called the Valley of the Moon. We slip between iron-red pinnacles with spines like the backs of prehistoric reptiles. Surely a

misplaced landscape, intended for some other world, it lacks the topography and soft edges of erosion that limn most of Mother Earth.

Beneath the shadow of the Licancábur Volcano, San Pedro has become an oasis village of sunbaked adobe houses and red dirt streets set between the desert and the altiplano. Some of the planet's most provocative landscapes ring San Pedro, enticing 36,000 visitors and ecotourists a year to its dusty little heart.

On most mornings, in the darkness before dawn, up to 30 vans and jeeps trundle along disastrously pitted roads, past herds of wild



Boasting more than 100 bird species, *La Perada*, a towering rock arch in the sea near the port city of Antofagasta. Like a low-profile, bushier flock the stone's surface, poised in gorges on a bounty of Pacific fish nourished by a cold, nutrient-rich upwelling. But overfishing, rising sea levels, and El Niño—wildly raised sea temperatures, driving fish from the coast to perdition—have threatened the birds' food source.



THE DESERT MAY BE A HEARTLESS KILLER, BUT IT'S A SYMPATHETIC CONSERVATOR—MOST EVERYTHING LEFT BEHIND STILL REMAINS.

vicuñas, to the 14,000-foot-high Tatío geyser field. This is the time to catch the spectacle of dozens of geysers erupting in unison. Other groups motor south to spy flamingos in the crunchy salt flats, or gather on a sand dune to wait for the blazing theater of sundown in the Valley of the Moon.

In San Pedro there are steak houses with cozy fireplaces and live Andean music. We stop for a cappuccino in a corner bar that advertises 15 types of coffee. But the town has become a shell of its former self: The native Atacama Indians who once lived here have now moved far from town. They're mostly farmers who grow fruits and vegetables using ancient irrigation techniques. They collect easy rent money from the newcomers living in San Pedro but gripe about the price of change. "The big hotels are not buying our local products," claims Juan Caerez, a round-faced farmer. "It's cheaper for them to bring produce in from Santiago."

I'm the sole guest on a guided trip from a pricey tourist hotel in San Pedro. My guide, Rosa Ramos, a beauty whose bronze skin stretches smooth and tight across high cheekbones and a classic Inca nose, cheerfully runs through her routine as we explore a canyon filled with waterfalls from rivers that flow from the Andes. She points out a desert pharmacy—*rica-rica*, a sage-colored bush used to cure stomach ailments, chanar trees good for coughs, algaroba trees for making *chicha*, an Andean liquor.

I ask Ramos what life was like here when she was younger, before the tourist rush. "When I was a small child, we ate mostly what we grew and raised—llama meat, milk from cows, cheese, tomatoes, corn, potatoes," she says. "In the summer our whole family would go high in the mountains where there are good pastures. Now our traditional way of life is almost gone. My mother has sold the sheep to pay for our

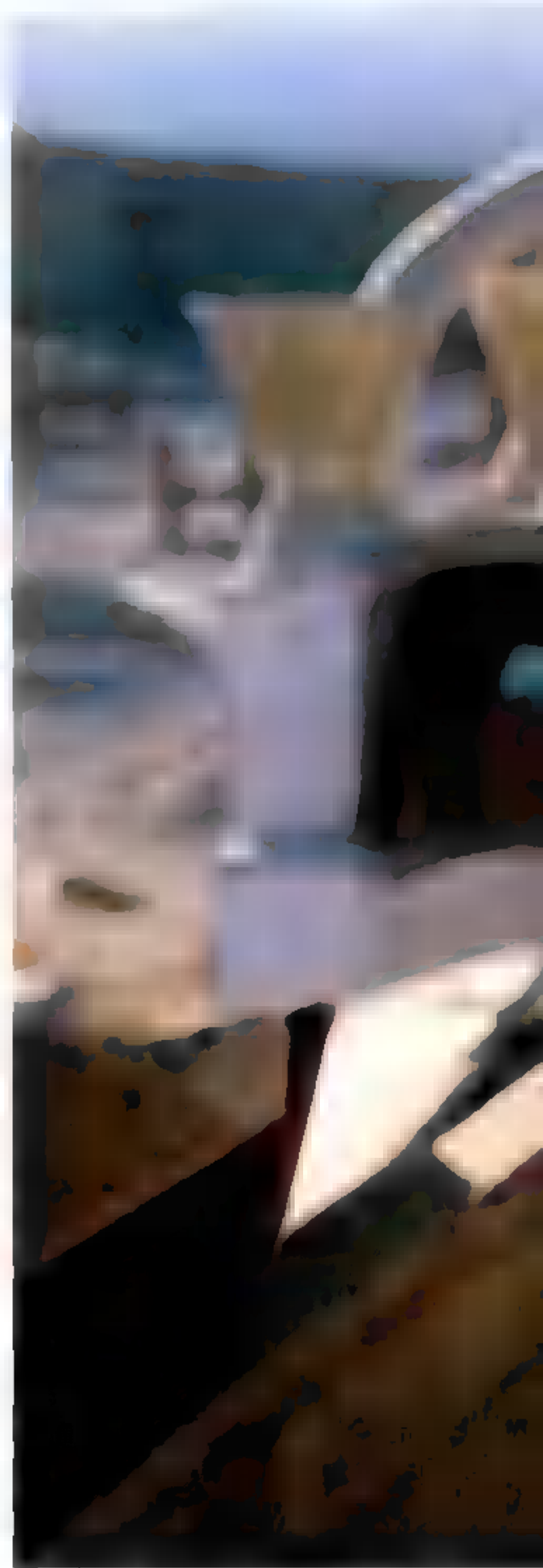
education. Young people like to have nice clothes, and so we find jobs in Calama, or in the mines, or in tourism. So here I am."

The Inca used to climb volcanoes to make offerings to their gods and ask for blessings, Ramos adds. "Now we climb for tourism." But a few months ago she and her husband hiked to the top of Licancábur and slept on the summit. "It was very emotional," says

Ramos. "We made offerings of coca leaf, corn, and chicha to Mamacocha, the mother of water."

After hearing Ramos's story, I want to make my own homage to the desert by spending a night where life does not exist—in the driest, most desolate region of the central Atacama. My guide, Sergio, takes us down an old nitrate road to a place where rain has never been recorded, where the possibilities of life are nil, where there are no survivors of the 10,000-year-old Atacama drought: no chiggers or scorpions, no moss or algae, no predators, no prey. Sterility.

As we stretch out our sleeping bags, there are no distant yaps of dogs or growls from diesel engines—only the soft buzz of wind. A sudden cold bores in, as if there were no atmosphere. We lean our heads back to find that the surrounding hills form an immense aperture to





LIVING DEAD “You die here, you dry here,” they say in the Atacama. Corpses left exposed by looters quickly shrivel in the sun. At this miners’ cemetery in Puelma, open coffins are everywhere, the bodies inside still laced in their boots. Many old mining settlements (and their dead) lie abandoned in this desert. Despite such desolation, the human footprint continues to swell, leaving its mark in the shifting sands.

infinity. The stars emerge. Orion the Hunter rises and stalks across the sky. A satellite, cheery and brisk, rushes through like a commuter late for work. The desert sky is not a curtain, but a deep, unutterably thick continuum of starlight that spirals off and fades to dust.

I lie awake, glad to feel a part of the desert, thinking about the stubborn resilience of life. Above, planets gleam coldly in the void. Like the Atacama, they too are hostile to life. Yet here, in the desert, as long as snowmelt fills the aquifers with fresh water, humans can endure.

But will they thrive? Probably not. After they

have exploited the land and sea with their industrial prowess and technological savvy, the desert will eventually spit them out. Copper may last another 50 years, but there are no new economic booms in sight. Soon life may be too costly, too arduous, or too brutish, and most of the current inhabitants will sound retreat, leaving their ancestors in the dust, perfectly preserved. □

WEBSITE EXCLUSIVE

Enjoy tales from the “absolute desert” with On Assignment notes from Priti Vesilind and Joel Sartore, then zoom in on more images at nationalgeographic.com/ngm/0308.



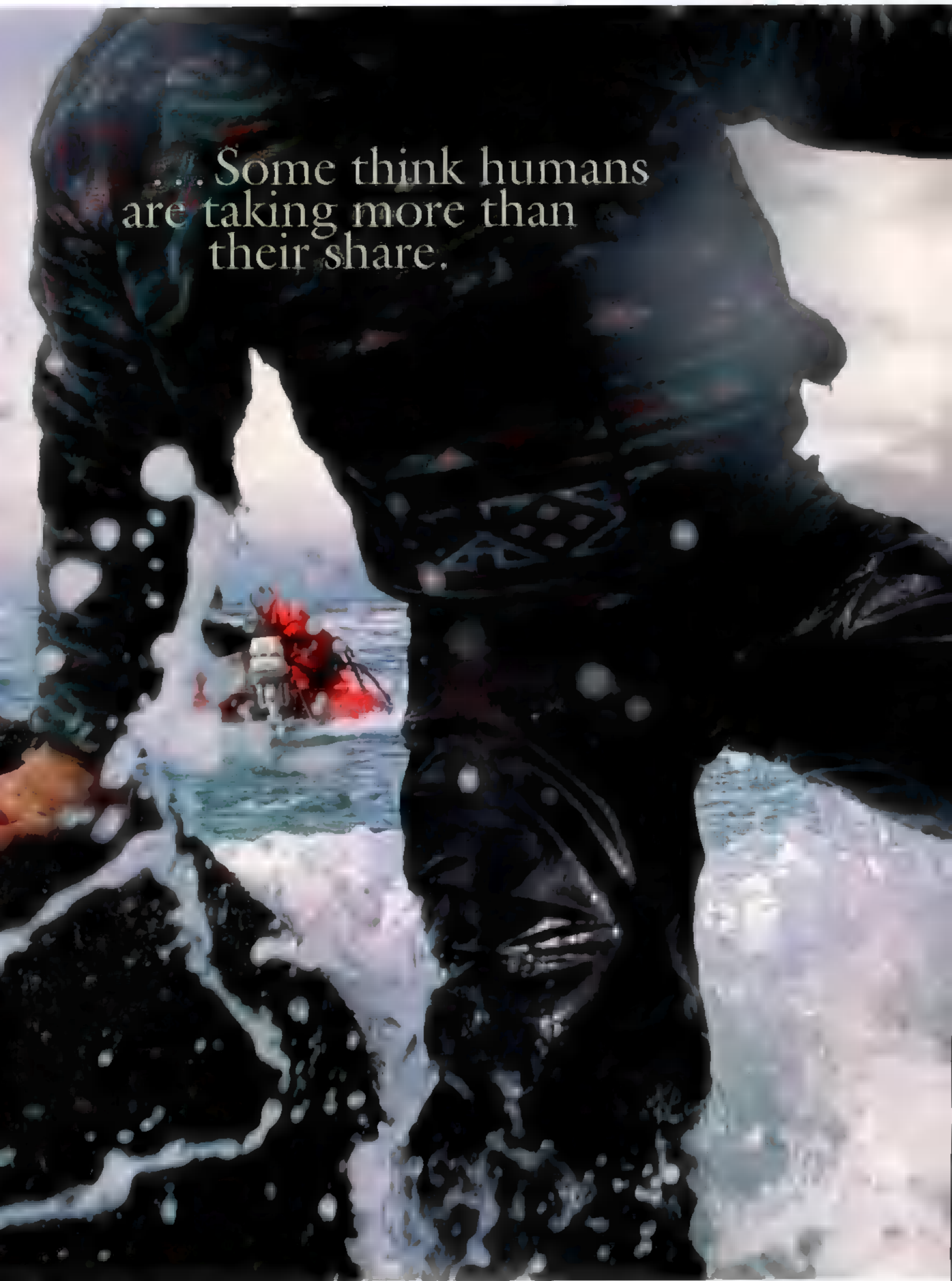
Kittiwakes cavort in the Alaska Maritime National Wildlife Refuge, a string of critical wildlife havens skirting the state's rugged coast.



Alaska's Wild Archipelago

Everything that flies
or swims along this
coastal refuge depends on
the sea's bounty to survive . . .

... Some think humans
are taking more than
their share.





Refuge biologists storm ashore on the island of Kiska, just as the Japanese did in World War II. Today's mission: Study the impact of rats, which arrived with the soldiers, on the refuge's largest auklet colony.

BY JOEL K. BOURNE, JR.

ASSISTANT EDITOR

PHOTOGRAPHS BY SUSIE POST RUST

Vernon Byrd, bundled from head to toe in an orange survival suit, clutched the side of a bouncing Zodiac as it skittered toward a ragged, two-humped island jutting from the frigid blackness of the Bering Sea. Bogoslof. Biologists like Byrd say the name as if the island were sacred, and in a way it is. The name means “theologian” in Russian. No ship can sail within three miles of its shore; no fisherman can venture within eighteen. Even the biologists in charge of the island visit only every few years so as not to disturb the raucous array of wildlife that inhabits every nook and cranny, from hordes of tufted puffins burrowing in the volcanic earth to a handful of Steller



sea lions—twice the weight of polar bears—lolling like giant sausages on the black sand.

“When I first came here in 1973, about 5,000 Steller sea lions ringed the island,” Byrd said, splashing ashore. “We tried to land, and they wouldn’t let us on the beach.” Now he counted only about two dozen massive heads above the throng of northern fur seals, the sea lion’s smaller, darker cousin. “Everything points to good prey availability at Bogoslof,” Byrd said with a tinge of Carolina drawl. “But sea lions continue to decline. And that’s interesting.”

Of course nearly everything in this salty realm is interesting to Vernon Byrd, who claims to have one of the best jobs in the U.S. Fish and Wildlife Service. As senior biologist for the Alaska Maritime National Wildlife Refuge, Byrd has the run of one of the strangest and farthest flung pieces of public real estate in the nation: a mostly vertical, guano-encrusted archipelago that

includes 2,500 islands, cliffs, and outcroppings, not to mention 20 active volcanoes. If overlaid on the lower 48 states, his 4.5-million-acre domain would extend from Georgia to California to North Dakota.

Aside from a few scattered fishing villages and military outposts, most of the refuge is primeval wilderness rarely seen by human eyes. Yet it’s a mecca for wildlife, attracting one of the largest concentrations of seabirds and marine mammals in the world. More than 40 million seabirds—80 percent of Alaska’s total—and thousands of sea lions, sea otters, seals, and walrus flock to these storm-wracked shores to rest, breed, and raise young during the short northern summer.

The heart of the refuge lies in the Aleutian Islands, that long bony finger of Alaska that tickles the chin of Russia. The Aleutians separate two of the richest marine ecosystems on the planet: the North Pacific and the Bering Sea. The plankton-laden waters support an astonishing array of marine life, not to mention thousands of fishermen, processing-plant workers, and Alaska natives. The symbiotic relationship between land, water, people, and wildlife is as palpable here as the shroud-like fog or horizontal rain.

But despite such apparent abundance, all is not well on this Alaska coast. Since seabirds and marine mammals consume vast quantities of fish and plankton, they make good bellwethers for the health of the marine ecosystem. Thousands of top predators in western Alaska waters have vanished within the past 50 years, including more than half of the northern fur seals, 75 percent of the sea otters, and 80 percent of the Steller sea lions, which were listed as endangered in 1997. Some scientists think a slight rise in the temperature of the Bering Sea may favor leaner prey species, like pollock, over fatter capelin and herring. Others suspect high levels of DDT and PCBs in the animals, toxins that have migrated north in the atmosphere or were spilled at military bases on the islands. Environmental groups point the finger at a commercial fishery that removes some two million metric tons of

A sea otter cradles her pup off Adak Island. Hunted to near extinction by 1911, sea otters rebounded in the Aleutians until the 1980s. Since then their numbers have fallen 75 percent, one of the sharpest wildlife declines in recent history.



JOE SARTORE

Fishing the Frontier



Processing-plant workers on Unalaska unload a hold full of fisherman's gold—in this case halibut—from one of hundreds of boats plying the brutal but lucrative waters of the Bering Sea. About a tenth of all seafood caught in U.S. waters comes through Unalaska Bay (right) and nearby Dutch Harbor, one of the best anchorages in the Aleutians.

potential prey from the Bering Sea each year—roughly half of all U.S. fish landings.

The issue boiled over three years ago after several groups sued the National Marine Fisheries Service, the agency responsible for regulating fishermen as well as protecting endangered marine species. A federal judge sided with environmentalists, prompting the service to ban trawlers for 20 nautical miles around key sea lion sites. The ban infuriated fishermen and Alaska Senator Ted Stevens, who claimed it had little scientific basis. Stevens inserted language into an appropriations bill that granted a year to come up with a more palatable plan—today a hodgepodge of protected zones ranging from 10 to 20 miles—and he earmarked more than 40 million dollars for new research to find the cause of the sea lions' decline. How to best protect the sea lions remains hotly debated, leaving scientists like Vernon Byrd to scour the refuge for clues.

The Steller sea lion isn't the first of Georg Wilhelm Steller's discoveries to run afoul of humans. As Vitus Bering's naturalist on the Russian expedition that discovered Alaska in 1741, the German scientist spent barely three days on Alaska soil, yet returned to Russia with descriptions of numerous species unknown to the Western world. Many carry his name, including the Steller's jay, Steller's eider, and Steller's sea cow, a docile relative of the manatee.

But it was a species that does not bear Steller's name that entertained him the most. "Altogether it is a beautiful and pleasing animal, cunning and amusing in its habits, and at the same time ingratiating and amorous," wrote Steller after observing a frolicking sea otter. "[It] deserves from us all the greatest reverence."

Bering's sailors, however, had something else in mind. After surviving a shipwreck and scurvy, which took Bering's life, the crew limped back



to Petropavlovsk in a makeshift boat loaded down with 900 sea otter pelts. For each pelt, Chinese merchants paid the equivalent of a year's wage for a Russian clerk, beginning a legacy of natural resource exploitation along Alaska's coast that continues to this day. Russian fur traders enslaved the seafaring Aleuts who inhabited the islands, forcing them to hunt sea otters, and later fur seals. While Aleut hunters speared otters from their skin kayaks, known as *baidarkas*, the Russians lived like Cossack kings among the Aleut women. Their motto: "God is high above and the tsar far away." By the time the Russians sold Alaska to the United States in 1867, they had wiped out more than half a million sea otters and millions of fur seals, while their guns and diseases had reduced the Aleut population from an estimated 12,000 to roughly 2,000.

Not to be outdone, U.S. fur traders more than doubled the annual Russian fur harvest.

When sea otters and fur seals were finally protected by international treaty in 1911, the otter was all but extinct, and only a tenth of what had once been 1.5 million fur seals remained.

President William Howard Taft declared the Aleutian chain a wildlife reserve in 1913 primarily to protect the sea otters, and the population slowly began to recover. By the 1980s, with the help of Fish and Wildlife Service biologists, otters had reestablished themselves on many islands and were back to healthy levels of more than 65,000 in the Aleutians. But then Jim Estes noticed their numbers drop again.

Estes, a soft-spoken U.S. Geological Survey scientist, has spent most of the past 30 years studying the interwoven relationships between otters, sea urchins, and kelp in the islands, and now and then his ideas rock the boat of ecology. His latest theory: The falling population of sea otters, fur seals, and Steller sea lions has nothing

ASIA

RUSSIA



Fog of Battle

A gun mount near Dutch Harbor reminds visitors of World War II battles fought on U.S. soil, the 15-month campaign to retake Attu and Kiska from the Japanese. Aleutian bases were part of the Ice Curtain of the Cold War, a hot spot for nuclear brinkmanship.

Bering Sea

Matthew I.

Paul I.

Pribilof Islands

St. George I.

Hagemeister I.

Admiral Island

Buldir I.

Kiska I.

Amchitka I.

Agassiz I.

Agassiz I.

Dutch Harbor
Unalaska Bay
Unalaska I.
Bogachev I.

Unalaska

Unalaska I.

MARITIME

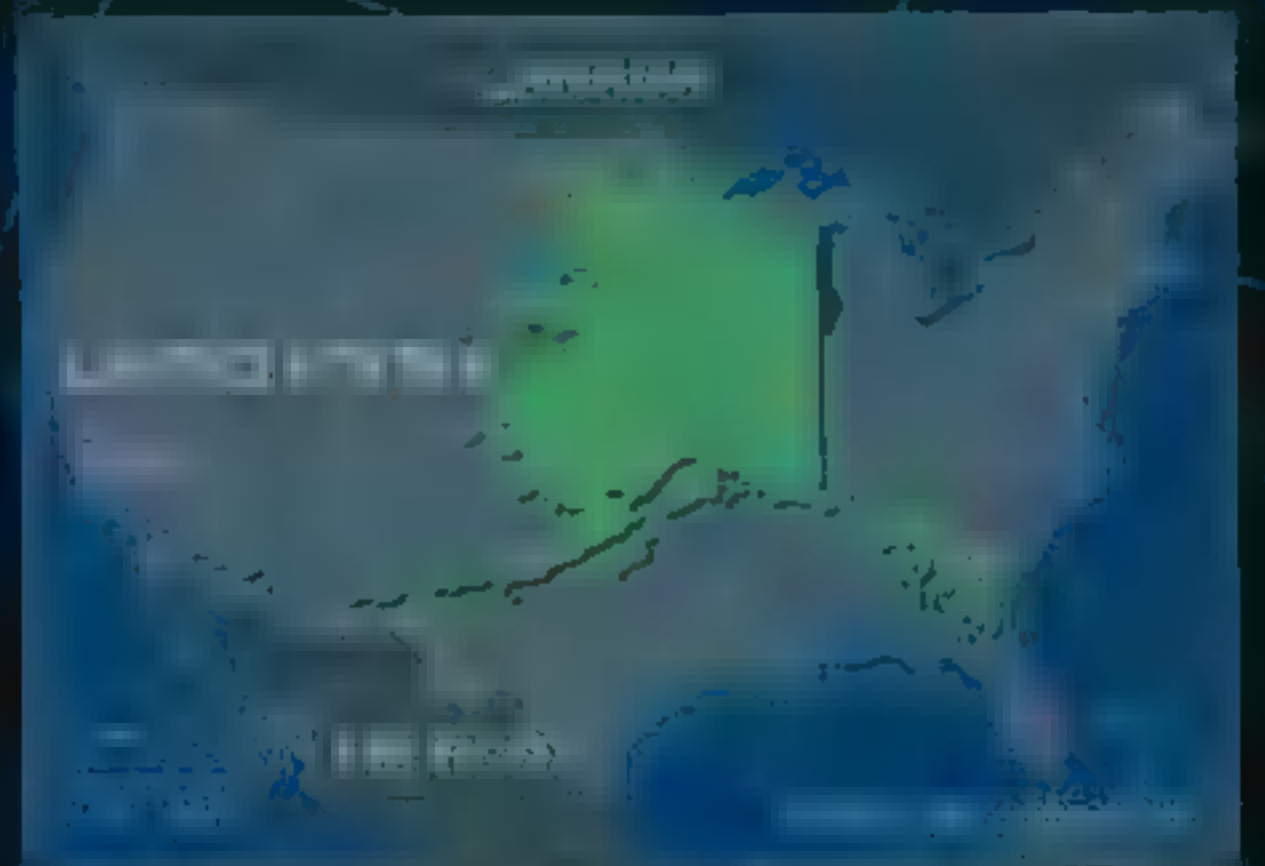
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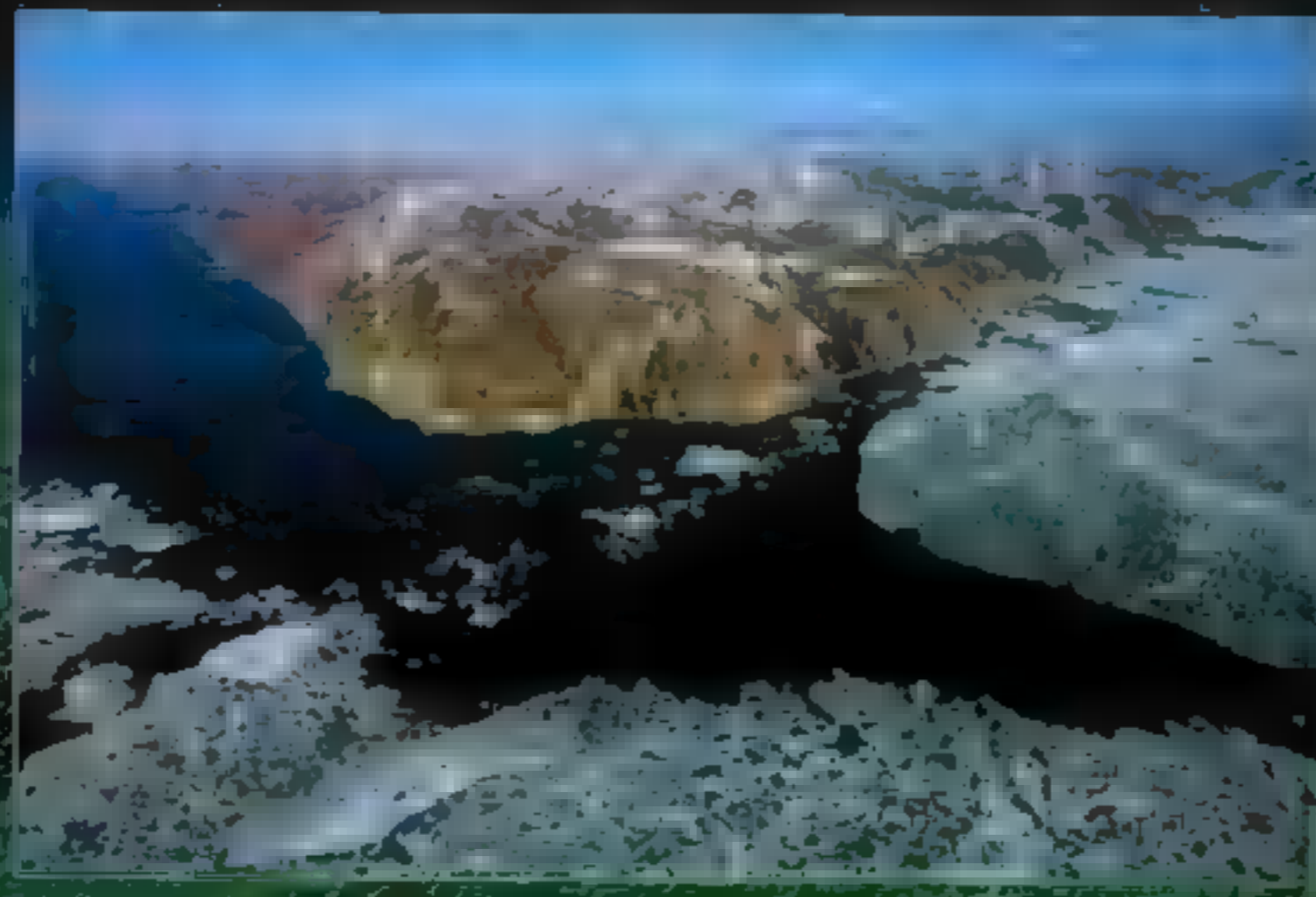
WILDLIFE

Legacy of Wildlife and War

With some 2,500 islands, cliffs, and rocky spires dotting Alaska's vast coastline, the Alaska Maritime National Wildlife Refuge is transcontinental in scale. Each year millions of seabirds and thousands of marine mammals return to these craggy shores to raise their young. Most of the refuge is gale-whipped wilderness rarely glimpsed by humans. But human impacts have been profound, from the introduction of foxes and rats, to overfishing and pollution from military bases.

NORTH PACIFIC OCEAN





The Ice Thaw

Summer, home to a half million murre and kittiwake, Cape Lisburne (above) supports the refuge's northernmost seabird colony—and the one most vulnerable to changes in Arctic ice cover from global warming. The early breakup and dispersion of sea ice in recent years made it difficult for kittiwakes to find prey, leading to the birds' first known failure to lay eggs.

ALASKA
(U.S.)

CANADA

NORTH
AMERICA

Anchorage

Homer

Juneau

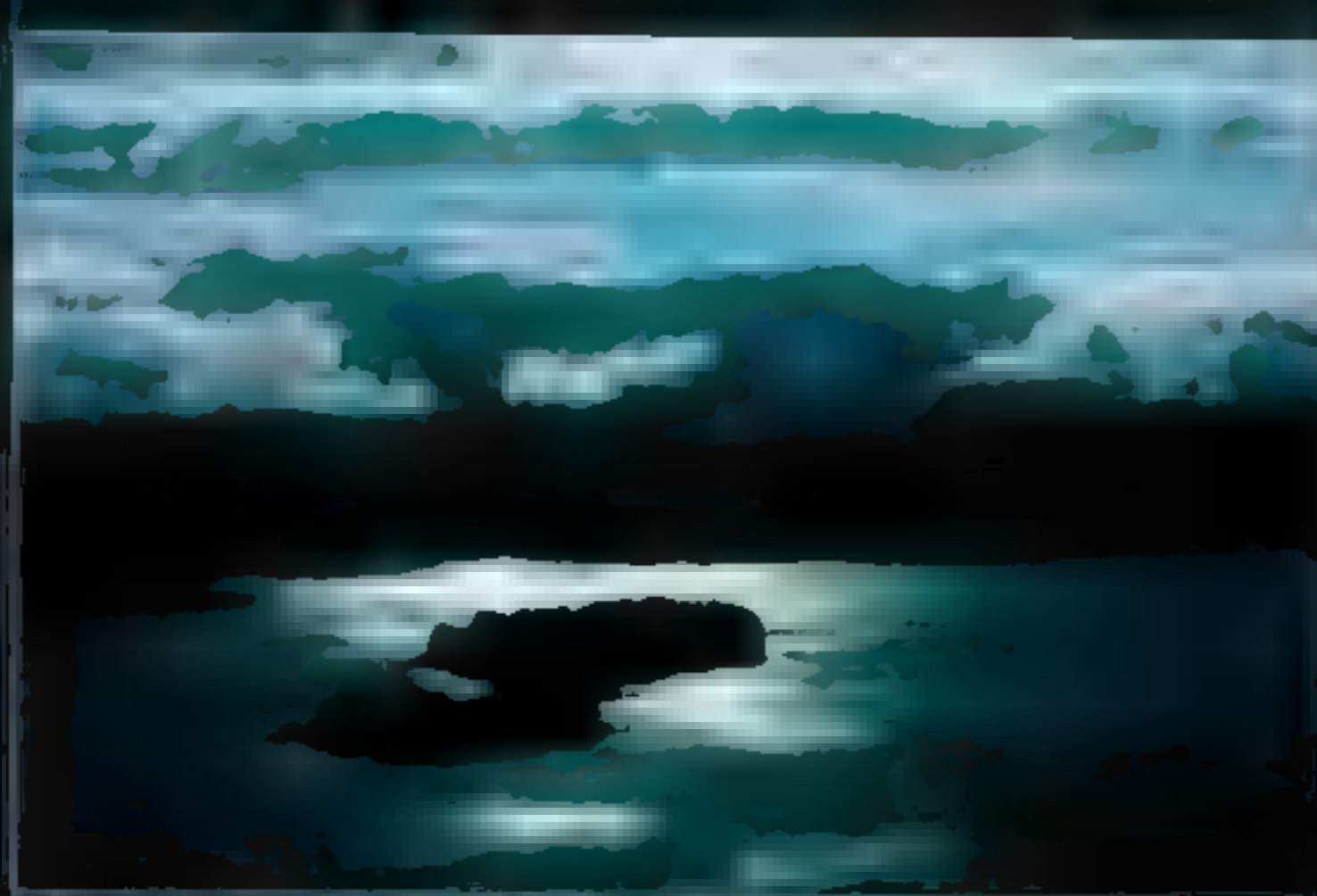
Sitka

Lazaria I.

Hazy Is.

Forrester I.

Gulf of Alaska



Petrel Central

Just 15 miles from Sitka, St. Lazaria (above) is one of the refuge's few islands in southeast Alaska, where seabird and marine mammal populations have remained relatively stable. Barely a mile long, the island lures some 250,000 pairs of storm-petrels each year and the occasional brown bear from nearby islands.

REFUGE

Land included: Alaska
Maritime National
Wildlife Refuge

Alaska Maritime N.W.R.
includes some public and
private land holdings.

Scale varies in this perspective.

Distance from Attu Island to
Dutch Harbor is 845 miles
(1,360 kilometers).

DIGITAL ELEVATION DATA
BY U.S. GEOLOGICAL SURVEY
NATIONAL GEOGRAPHIC MAPS



to do with temperature increases, overfishing, or contaminants. Estes thinks they're being eaten.

On a crisp summer morning I joined Estes and fellow researcher Tim Tinker for an otter survey of the waters around Adak Island, a former Cold War spy base so far out in the Pacific it's closer to Petropavlovsk than to Anchorage. Estes handed me an orange flotation suit before we boarded a 17-foot Boston Whaler for the survey. "They're not really survival suits," he said, pulling the heavy coveralls over his lanky frame. "They just help rescuers find your body."

Luckily it was one of those rare bluebird days that occur perhaps once a month in the Aleutians, when the clouds part, the wind dies, and the rugged splendor of nature's handiwork is etched against the pale northern sky. Soon we were nosing along a rocky shore seemingly unchanged since Steller's time. The waterline embraced a labyrinth of habitats transformed

by each tide. Rainbow-hued harlequin ducks and mottled brown common eiders flushed from hideouts, while mountains rose 2,000 feet straight up from the jade water. But as we cruised through the watery niches that were classic otter habitat, we spotted few otters. Those we did see were wary: Their wizened faces quickly submerged at our approach. By the end of the day, we'd tallied just 59 adults and 21 pups. Estes shook his head. "A decade ago we would have seen 600."

That evening, over baked halibut and beer, Estes explained his theory. When he visited nearby Amchitka in the early 1990s and discovered that half the island's sea otters had disappeared, he found high levels of DDT and PCBs in those that remained. He suspected the contaminants might be the problem. But on other islands he found populations with low contaminant levels, and they were falling too. He was baffled.

Life Among the Seals



Taking a break from baiting halibut hooks, Warren Kushin (left, at left) chats with friends under the midnight sun on St. Paul, in the Pribilof Islands. Home to more than half the world's northern fur seals and the largest Aleut village in Alaska (above), the island—once the gold mine of the Bering Sea fur trade—now struggles for economic survival.

Then one of his colleagues witnessed a startling phenomenon: A killer whale came up and chomped an otter. Though orcas are known predators of much larger sea lions and seals, few had ever seen one take an otter, which would be the orca equivalent of an after-dinner mint. But the next day the researcher observed another attack. Then Tim Tinker saw it happen at Adak. Soon some of the otters they'd implanted with radio transmitters were disappearing.

Though Estes was skeptical at first, he and Tinker began to suspect the connection when they noticed that sea otters in Adak's Clam Lagoon were *not* disappearing. The lagoon otters don't go out to sea, and orcas are blocked from entering the lagoon by the pilings of a small one-lane bridge at its mouth. But elsewhere off Adak, Tinker said, "otters were dropping like stones." By 2000 up to 90 percent of the otters on some islands were gone.

What would make an orca that evolved to eat great whales and other large prey target a 60-pound otter? Estes believes the root of the problem may go back to the days of commercial whaling. From the 1940s to the 1960s, whalers killed half a million whales in the North Pacific and southern Bering Sea. With the large whales gone, Estes thinks the orcas turned to sea lions and harbor seals, whose numbers then fell through the late 1980s. Once they ate their way through much of the pinniped population, he believes the orcas changed prey again, taking some 40,000 sea otters in the central Aleutians alone in the past 15 years.

"It's an incredible theory," Estes said. "It may or may not be true. But it makes a lot of sense."

Maybe. But Chuck Fowler, former head of the fur seal program for the National Marine Fisheries Service, believes the orca hypothesis minimizes the impact of the most adaptable and





Staying well out of reach of aggressive bulls, a researcher picks dead fur seal pups from a St. Paul rookery to look for clues to a 50 percent population decline since the 1950s.

Research and Recovery



Counting birds is a full-time job for refuge staff on St. Lazaria (right) and Buldir (far right), where biologist Vernon Byrd (above) and crew captured 17 Aleutian Canada geese for a breeding program in Russia. Once believed extinct, the birds are now flourishing.



robust predator in these waters—humans. “Commercial fishing takes biomass out of the Bering Sea at levels ten- to one-hundred-fold more than the marine mammals are taking,” said Fowler.

If fish scales were money, the muddy streets of the city of Unalaska—also called Dutch Harbor after its port—would be paved with gold. Tucked in the eastern Aleutian chain, the town of about 4,300 permanent residents boasts the best anchorage in the islands, making it ground zero for the fishery–marine mammal debate. Thousands of transient fishermen and processing-plant workers come here each year to find their fortune. “It’s like the end of the Wild Wild West,” said Rick Knecht, director of the local Museum of the Aleutians. “Even in the rest of Alaska people think we’re just a bunch of drunk fishermen brawling in the streets out

here. But now more families are moving in. It’s becoming a real town.”

Since 1988 Dutch Harbor has consistently ranked as the top fishing port in the nation in either pounds landed or value of product or both. It’s the latest upswing in a historic boom-and-bust cycle that began when the village was the western center of the Russian sea otter trade, followed by the herring boom and crab boom, all of which eventually fizzled. The money fish of the moment is walleye pollock, a sleek, prolific cousin of the cod that accounts for a third of all U.S. landings. Big trawlers, ranging from 130-foot catcher boats to 300-foot floating processors, are allowed to net more than a million metric tons of pollock each year. Long a staple in the varied diet of Steller sea lions, pollock is now in just about every fish stick, fish-filet sandwich, and tub of imitation crabmeat sold in the U.S., Europe, and the Pacific Rim.



“Most people aren’t aware of what’s out here,” yelled Rocky Caldero, manager of the UniSea processing plants, as he led me through a maze of machinery, conveyors, and catwalks that was throbbing to a high-voltage hum. “The plants here are the largest and most complex fish-processing plants in the U.S. The top three or four in the world in terms of volume. We’ll process 2.2 million pounds a day of just pollock.” Virtually every ounce of the fish is used. The roe is a popular and expensive gift in Japan. Filets are flash frozen and sold throughout Europe and the U.S. Fish too small to filet are churned into surimi, a white, tasteless, rubbery paste that is a major ingredient in artificial crabmeat. The waste is ground into food for eel farms in Asia. Even the oil is burned as fuel in the plants’ generators.

The sea lion ruling that temporarily extended the fishing ban around rookeries in 2000 hit the

industry hard, said Caldero. Boats had to go farther out to get the pollock, reducing the freshness of their catch. “Instead of getting fish less than 40 hours old, you get fish 60 to 80 hours old,” Caldero said. “You can’t do much with that. You can’t make filets. Roe quality is diminished.”

Like most people in the business, Caldero buys the industry position that the pollock fleet is the best managed fishery in the world. “Most people in the industry want to protect it to make money,” Caldero said. “They don’t want the sea lions to go the way of the sea cows. I don’t think fishing pollock is the problem. The studies I’ve read say there’s not enough nutritional value in pollock to make the sea lions survive.”

Those studies, based on captive-feeding trials, show the animals lost weight on a steady diet of pollock but not on oilier fish such as herring or sand lance. It’s come to be known as the junk food theory. Since pollock are voracious

predators of other prey species, the industry line goes, then fishermen should catch more pollock to allow the other species to rebound.

"None of these theories can be proven," said Ken Stump, one of the Greenpeace architects of the environmental lawsuit that led to the fishing ban. "The industry latches on to the junk food hypothesis, ocean warming, and orca predation because they believe it exonerates them if it's a natural phenomenon." Stump believes that the removal of 150 billion pounds of fish from Alaska's waters since the 1960s has likely caused a fundamental shift in the marine ecosystem: There simply isn't enough food left to support historic populations of marine mammals.

Bob Storrs can see both sides. The wiry, bearded fisherman has been an environmental activist for two decades in Unalaska. When he's not fighting to protect local small-boat fishermen from the politically powerful factory trawlers, he's either pulling halibut over the rail of his 32-foot long-liner or sipping his whiskey neat from a corner stool at the Elbow Room—Unalaska's notorious bar and the de facto headquarters of the Bering Sea fleet. Yet he sided with the big boys against the 20-mile ban around rookeries.

"The folks that were hurt the worst were the small-boat fishery," said Storrs from his perch at the Elbow. "If the ban had stayed in place, I would be out of business as would everyone else. It made it very hard to be an environmentalist in western Alaska." Still, Storrs believes the industry is at least partly responsible for the sea lions' decline, but not because the animals are starving. "There was a huge take of sea lions by the pollock trawl fleet in the 1970s," said Storrs, shaking his head. "It was legendary. They were getting 40 sea lions a tow and dumping the carcasses overboard."

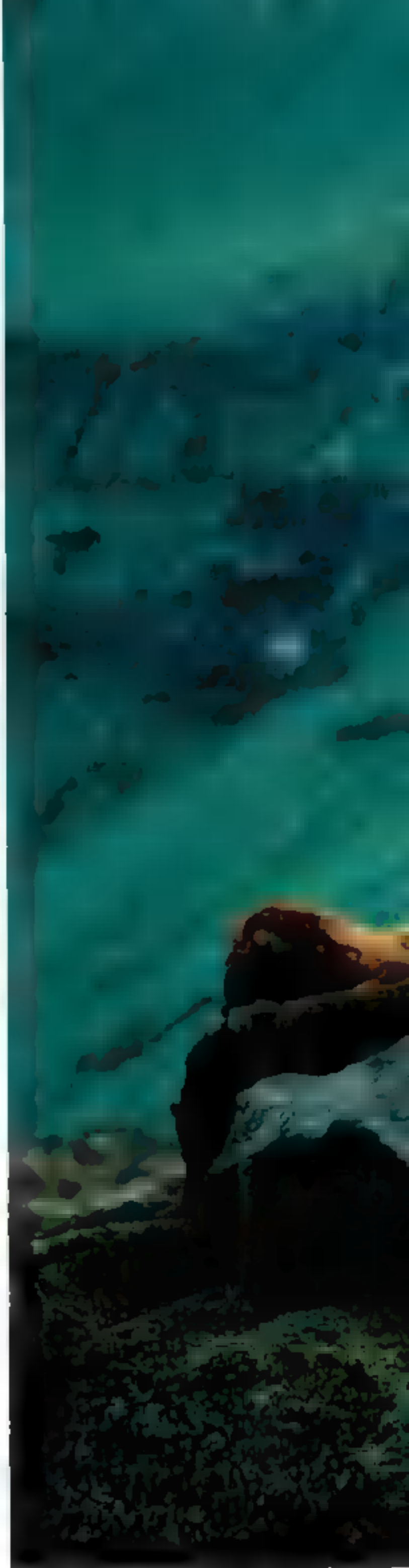
In fact, scientists estimate that U.S. and foreign trawlers may have caught as many as 50,000 sea lions in Alaska waters between 1960 and 1990, while fishermen legally shot an estimated 34,000 during the same period, ostensibly to protect their livelihood and their gear. Long viewed as a nuisance to fishermen, the sea lions finally gained protection in 1990 from shooting by all but Alaska native subsistence hunters.

Studying the ocean's inhabitants has never been easy, especially in the often brutal seas that Steller sea lions call home. Vernon Byrd believes

that natural and human factors have combined against the animal. "No doubt removing the fish has had large effects," Byrd said. "But will this cause extinction? We don't know. Then here come the killer whales. They've always eaten a certain number of sea lions. But now with the population depressed, they take more, percentage-wise. Then you have a bad storm year, which increases pup deaths, and things start stacking up. But I try to explain all that to a guy with boat payments, and he says, 'Are you sure?'" Byrd paused, then answered the question. "No, I'm not."

Times may be good for the pollock fishermen of Unalaska, but they're decidedly rocky for the people of the Pribilofs, the small group of islands smack in the middle of the Bering Sea. Here the largest remaining Aleut villages of St. Paul and St. George, each on a separate island within the refuge, are barely keeping their economies afloat.

The two islands, breeding grounds for the largest northern fur seal colonies in the world, were the mother lode of the fur seal trade for nearly two centuries, a source of unimaginable wealth, and an underlying force behind Seward's Folly in 1867. The federal government's sale of furs from the Pribilof harvest repaid the 7.2-million-dollar purchase price for Alaska within 20 years. The 1911 fur seal treaty banned taking the animals at sea and limited commercial sealing to government-controlled harvests by the Pribilof Islanders, who dutifully slaughtered seals for Uncle Sam until the mid-1980s, when animal-rights activists and a dwindling fur market shut down the federal harvests for good.





Karin Holser opened a closet door in her office in St. Paul and pulled out samples of what all the fuss was about. The first was a tanned sea otter pelt, jet black and so soft to the touch it was hard to tell where air ended and hair began. Beside it she threw a fur seal hide, buff brown, but equally luxurious. "This is where the animal-rights folks did us a disservice," said Holser, coordinator of the islands' stewardship program for local youth. "Here was a sustainable harvest that supported an indigenous village. People were feeding their families, not a huge industry."

After commercial sealing ended, St. Paul joined the lucrative crab fisheries in the Bering Sea. Then the Pribilof red and blue king crab stocks crashed, followed by the *opilio* snow crab stocks. Crabbing seasons closed, the island's two processing plants cut back, and 80 percent of the tax base evaporated. Today two dozen small long-line vessels fish for halibut around the island,

A Steller sea lion bellows its trademark roar near Unalaska. Steller populations have tumbled 80 percent in western Alaska waters since the 1970s. Most environmentalists blame overfishing, while most fishermen blame everything else.

providing up to half of many families' incomes.

Though the steady paychecks of the sealing days are sorely missed, the heavy hand of the federal government is not. Many elders still smolder over their treatment in World War II, when the Pribilof Islanders were evacuated to squalid "duration villages" near Juneau while the U.S. military took over their islands. Forced to crowd into an abandoned cannery and a mining camp without proper food, heat, or running water, the Pribilof Islanders lost 32 people to pneumonia, measles, and tuberculosis during their two-year internment. Most were elders and children. To make matters worse, when they



JOEL SARTORE

finally returned home in 1944, they discovered that U.S. soldiers had vandalized their houses and their church.

"We were really mad," said 80-year-old "Auntie" Mary Bourdukofsky, who had two children in diapers at the time. "We saw pictures of a German POW camp, with nice Quonset huts with bunk beds and white ceilings. Our feelings really hurt inside for treating us worse than the enemy."

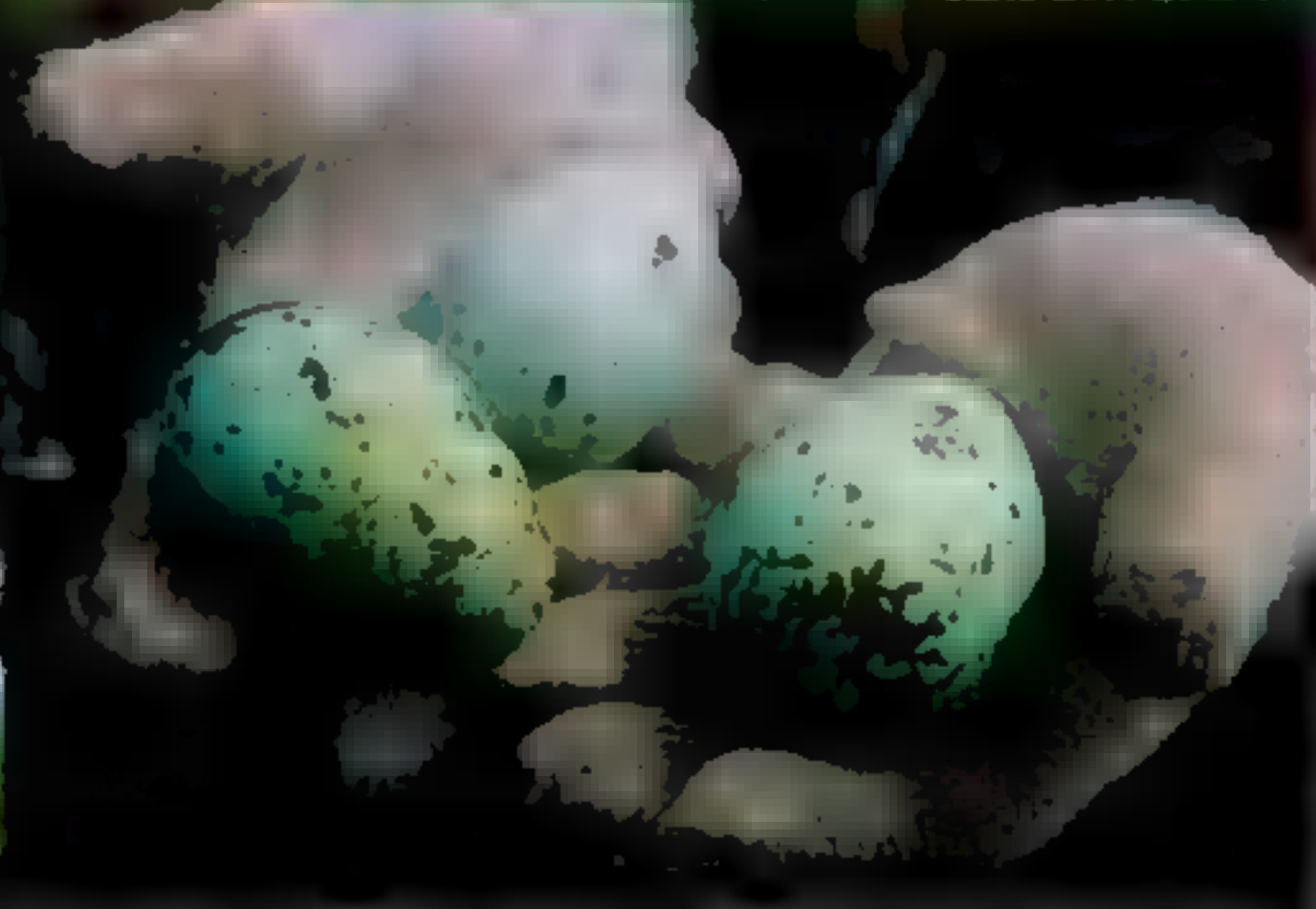
But her wartime experience and the years of paternalistic management by the Fish and Wildlife Service, which controlled almost all aspects of island life until the early 1980s, hasn't dampened Auntie Mary's enthusiasm for her wind-swept home. "My mom said we live by the sea, and we never grow old," she said with a smile.

That same twinkle lit the eyes of 25-year-old Candace Stepetin as she gave me a tour of St. Paul in a pickup with Van Morrison's "Brown Eyed Girl" blaring through the speakers. Stepetin

works with the St. Paul stewardship program cutting fishing nets and plastic packaging from seals that come ashore with a garrote of such garbage around their necks. She showed me three neat puncture scars in her right hand, courtesy of a two-year-old seal she was trying to liberate. "If it had been a larger seal, he could have pulled my arm off," she said. She pointed out the graveyard, the bar, the Russian Orthodox church, and a hundred or so clapboard houses where 500 residents live. The village hugs a small harbor protected by a 50-foot-tall breakwater.

Outside the village the island rises in lush hills of purple lupine and wild celery, dotted with Aleutian buttercup. But it's the ash-colored beaches attracting hundreds of thousands of northern fur seals, along with more than two million birds that nest on neighboring St. George, that spurred the islands' nickname "the Galápagos of the North." At the rookeries,

Land of Plenty



"They're not bad boiled," says St. George mayor Alvin Merculief (above), who has picked blue murre eggs from the island's cliffs since childhood. Seabirds, like those on hundred-story High Bluffs (far left), outnumber the islanders some 15,000 to one.

the big 400- to 600-pound males staked out their territories, which they will defend—fighting and breeding without food or drink—for up to two months. Most of the females, however, had yet to arrive. Only a few lay beside bleating pups. The young bachelors avoided the big bulls, content to sun themselves on their favorite beaches.

While the mass of steaming, writhing bodies is impressive to the first-time visitor, the image is deceiving. Nearly a million fur seals still swim in the North Pacific and Bering Sea, but that's half the number observed in 1951, when in these pages biologist Karl Kenyon described the rookeries as "the greatest assemblage of wild animals to be seen in such a limited area." Compared with photos from Kenyon's time, the beaches look practically empty.

Though federal harvests ended in St. Paul in 1983, the islanders still kill about a thousand juvenile male seals each year for food. The

elders relish the boiled meat, pickled flippers, and a rendered seal fat dish some call Aleut Jell-O, but most of the young people I met preferred microwavable pizzas from the local grocery store.

The hunts are community affairs. During one roundup, six islanders set out across the beach to make the initial cull. The seals stampeded toward the water. Yet the Aleuts managed to cut off about a hundred of the younger ones. After separating a dozen or so seals from the main group, four men, their oarlike seal sticks held high, circled the animals as the fog rolled in. The heavy sticks rose and fell. Other men aided by a few children butchered the seals quickly, cutting out the ribs, the liver, the shoulders, the flippers. Tastes just like veal, said one man. Better than a turkey dinner, said another. A few of the once precious skins were saved for crafts, but most were carried to the carcass dump with the rest of the offal.



Sculpted by volcanoes, glaciers, and monstrous seas, the ridges of Unalaska rise above the fog—remnants of the land bridge that once connected continents.





There are bright spots in the Bering Sea picture. Refuge biologists have spent decades nursing the Aleutian Canada goose back from the edge of extinction and—thanks to a concerted effort to remove non-native foxes from breeding islands—the birds are now thriving. Steller sea lion numbers are up slightly for the first time in decades, giving researchers hope that they may have reached the bottom of their long slide. And some islands, such as Bogoslof, seem to be drawing animals from traditional breeding areas such as the Pribilofs.

“It’s really interesting to compare Bogoslof and the Pribis,” Vernon Byrd said, back on Bogoslof. “They’re geographically similar, with very similar prey in the marine food web. Yet northern fur seals and red-legged kittiwakes have increased here, while declining in the Pribilofs. Why is the environment adequate at Bogoslof and not in the Pribis?”

One of the factors dropped right at our feet—a four-inch-long Atka mackerel, shiny silver on the bottom and midnight blue on top. The fish were flying by in a steady stream in the beaks of tufted puffins, which buzzed overhead like spacecraft in a Jetsons cartoon. The fish are so big, Byrd said, that a puffin chick will have to wait for the head to dissolve in its stomach before it can swallow the tail. “It’ll feed them all day,” said Byrd. “That means much less effort for the parents, who would otherwise have to feed them three or four times in the same period with tiny pollock. It translates into better breeding success. Interesting.”

Despite the dearth of sea lions on Bogoslof, Byrd is optimistic that the data will soon show what the problems are and that a combined effort from industry, managers, and conservationists will be able to avert their extinction.

Meantime, the prospects for other Bogoslof

Island Resurrection



In 1942 William Dirks (with son George, above) watched U.S. forces burn his village to keep it from the Japanese. Rebuilt replete with its Russian Orthodox church (left), Atka remains a crucible of Aleut culture, where dancers still celebrate the bounty of the sea.

creatures are looking better. In his inspection of the island, Byrd found that at least half the red-legged kittiwake nests had chicks, and the occupancy rate of puffin burrows was high. Male fur seals had established their territories on the beaches. And the sun was still shining, making Byrd practically giddy. "Sunniest day I've ever seen on Bogoslof," he said.

We headed back to the landing site and put on our orange suits for the ride out to the refuge's research vessel *Tiglaç*, at anchor a half mile offshore. The waves, though less than head-high, cracked on the steep beach with surprising force. We dragged the Zodiac down to the water, waited for a lull, and began paddling madly. But not madly enough. The first wave slapped the boat broadside. The next sucked it up and over, dumping us into the 38-degree water.

After crawling onto the beach like arthritic crabs, we tried again, digging the paddles deeper

into the numbing surf. A wave feathered 20 yards in front of us. We barely made it over the crest as the motor cranked and were soon skimming out of the impact zone to the waiting ship.

"All right!" Byrd yelled like a teenager, holding up his hand for a high five.

Georg Wilhelm Steller, Alaska's first naturalist, once wrote that he had fallen in love with nature. I couldn't help but think that Vernon Byrd had done the same. Steller had no inkling of things to come. Many of the animals he discovered on the expedition and described with such joy are now either extinct, endangered, threatened, or depleted. The future of those remaining now rests in the hands of scientists like Byrd—and our own. □

WEBSITE EXCLUSIVE

Find more images and field notes on the Alaska Maritime National Wildlife Refuge and its human and wildlife inhabitants at nationalgeographic.com/ngm/0308.

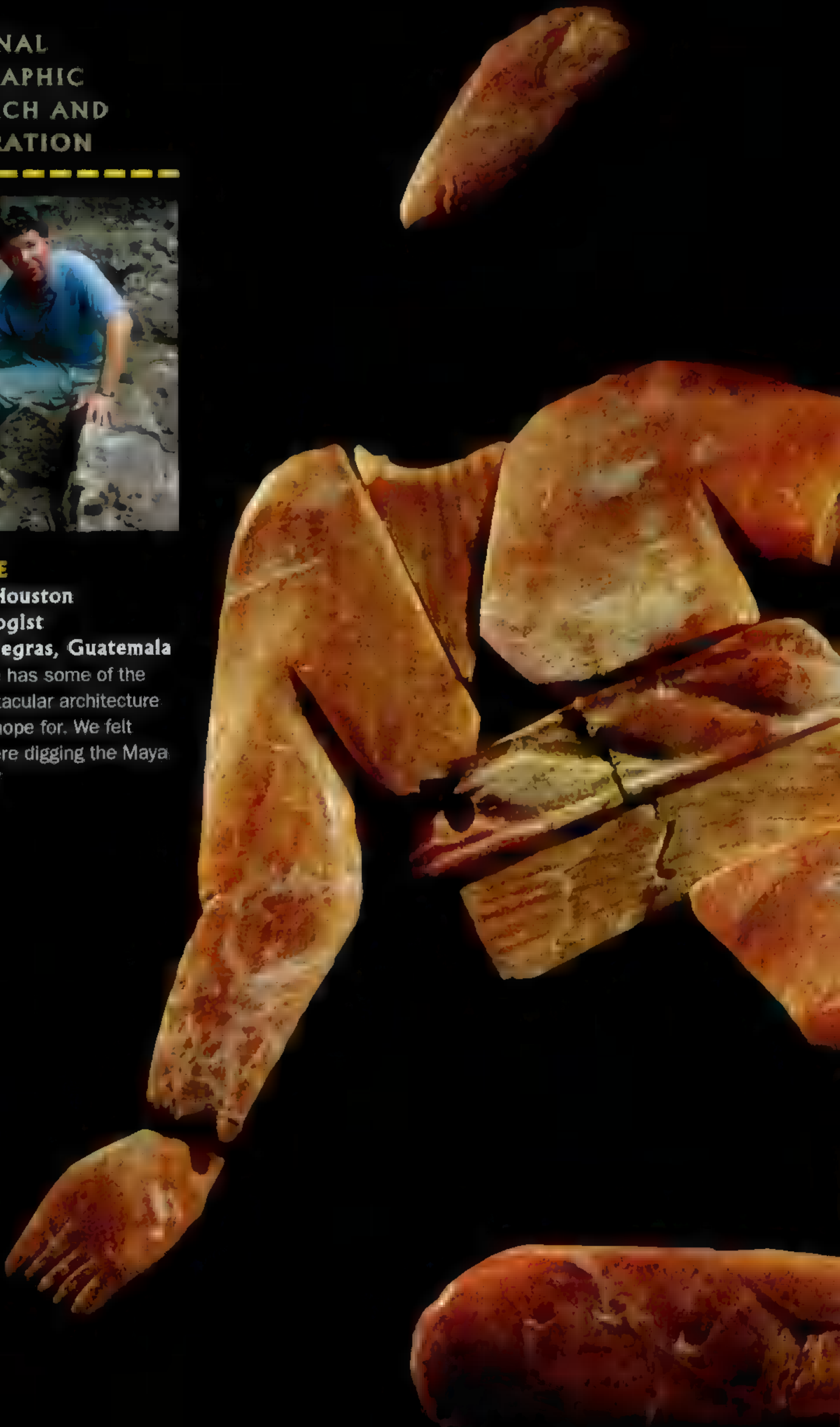
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EXPLORATION



GRANTEE

Stephen Houston
Archaeologist
Piedras Negras, Guatemala

"This place has some of the most spectacular architecture you could hope for. We felt as if we were digging the Maya Versailles."



M Royal City of the Maya

By Margaret G. Zackowitz
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by Mark A. Philbrick

Why go back to a Maya city that was first excavated in the 1930s, a site made famous when the Maya hieroglyphic code was cracked there two decades later? “We went to Piedras Negras because it had almost become a ‘lost city’ again,” says archaeologist and glyph expert Stephen Houston. “Archaeology has changed enormously, and new questions are being asked about Maya urban life.” Remote Piedras Negras, set beside the Usumacinta River, rose from a small village, thrived for some 400 years, and then collapsed. Houston, of Brigham Young University, has worked six years

Reassembled from pieces found in a royal tomb, this four-inch-high ballplayer mosaic shows trade with coastal centers: It's made of spondylus, a prized seashell. Hieroglyphics explain that Piedras Negras's ruler was captured by an enemy king about A.D. 800, but puzzles remain.



"I feel a responsibility to handle remains respectfully. I wonder, what did these eyes once see?"

—TIMOTHY HOVITON



THE PROJECT

DATES: 1997-PRESENT

FIELD SEASON: TWO MONTHS

TO GET THERE: DRIVE FIVE HOURS THROUGH BANDIT COUNTRY TO THE USUMACINTA RIVER, THEN MOTOR A DUGOUT FOUR HOURS—UPSTREAM.

FIELD CONDITIONS: SLEEPING IN POOLS OF SWEAT TO THE ROAR OF HOWLER MONKEYS; MONOTONOUS FOOD; STIMULATING RESEARCH.



on the site to find out why.

Before he could get to the Maya, he had to get past the Marxists. Delicate negotiations were required to persuade the guerrillas to leave their hideout so that Houston's team, including co-director Héctor Escobedo of Guatemala's Universidad del Valle, could set up camp. When they finally began excavating in 1997, they found that the guerrilla presence had, unintentionally, protected the site: "It's hard to loot a tomb with a machine gun pointed at you."

The wait was worth it; the city had new riches to bestow. Using the site's carved stelae, which bear rulers' names and the years of their reigns, Houston was able to date many of the objects he unearthed, in turn clarifying the history of dynasties and the city.

About A.D. 400, Maya kings began building pyramids and plazas at Piedras Negras to symbolize their link to the gods and legitimize their rule. The population grew to 5,000. Then, in A.D. 800, invaders captured the king. Piedras Negras "limped along for a few decades," says Houston, "but once the king was

A noble's tomb (opposite) emerges under Stephen Houston's brush; more than a hundred graves have been discovered so far. Alcoves in stone mark the entrance to Piedras Negras, where Houston (above, at left) and colleague Zachary Nelson examine petroglyphs. A five-inch-high torso (below), a masterwork Maya sculpture, was found with other royal goods in a servants' room. A clay whistle shaped like a midwife (right) dates from A.D. 650.

gone, the city had no purpose." Palaces were subdivided, ritual sweat baths filled with trash. Soon the people abandoned it altogether. The fate of Piedras Negras strongly suggests that Classic Maya culture collapsed not from drought or overpopulation, Houston says, but from the loss of the royal court and the erosion of public faith in the hierarchy. The things the residents of Piedras Negras left behind continue to tell their story. Stephen Houston is listening. □

WEBSITE EXCLUSIVE

Want to learn more about this "Maya Versailles," Piedras Negras? Find recommended websites and a bibliography at nationalgeographic.com/ngm/0308.



A Land

Whites once took land from blacks. Now blacks



Told to leave her family's game farm or be shot, a third-generation white Zimbabwean hugs an employee. Nearly all the country's white farmers have been thrown off their land since 2000.

Possessed

have taken it back. In the upheaval Zimbabwe goes hungry.



By Peter Godwin • Photographs by Gideon Mendel

Three generations of the Stauntons, a white Zimbabwean family, huddle in the small sitting room of a safe house in the capital, Harare, surrounded by suitcases and cardboard boxes. They have been chased off their farm with a suddenness that has left them blinking in bewilderment. Now they wait to leave Zimbabwe for an uncertain future in Australia.

One Tuesday afternoon last year a motorcade of luxury SUVs wound its way slowly across Kachere Farm, which the Stauntons had owned since 1957. The farmworkers reported that behind the dark tinted windows sat Grace Mugabe, the president's young wife, and her entourage. She apparently liked what she saw: neat fields of maize and soybeans, wheat and potatoes, large greenhouses of roses for export to the Amsterdam flower market.

Within weeks the Stauntons' garden was full of men and women armed with iron bars and guns. The grandparents, James and Margaret, in their late seventies, phoned the police before locking themselves in the bathroom with their daughter, Angela, and young granddaughters, Caitlin and Sarah, as the attackers smashed down the back door and looted the house. When the Stauntons finally emerged after two hours, they found the remains of their belongings scattered on the lawn.



Farewell Harvest Promised a share of the crop if they came back to cut the wheat, Jeremy and Janet Selby return to their former farm. Seized, like much white land, without due process, it now belongs to an army officer and a local official with no experience in farming.



Party Faithful Delegates at a political conference sing the praises of the man emblazoned on their chests—President Robert Mugabe, the architect of land reform. White farmers who oppose him are “enemies of our people,” Mugabe told delegates.

According to the Stauntons, they were ordered off the farm by men who stood with crowbars over their children, while the police looked on passively. The attackers then gave the police a lift back to the station.

The Stauntons were caught up in the final throes of a government campaign to force the country's white farmers off their land without compensation, land they have inhabited for much of the past century. By early this year only 200 of 4,500 white-owned farms remained fully functioning. The endgame for the white farmers can be traced to a fateful day in 2000 when Zimbabwe's president, Robert Mugabe, lost a referendum on a new constitution that would have greatly expanded his powers. For this upset defeat—his first—Mugabe would blame the white farmers, accusing them of supporting the newly formed opposition. He said the farmers had enlisted their black employees to vote for the opposition too. Thousands of members of Mugabe's ruling party, ZANU-PF, immediately began to occupy farms. Ten white farmers and 27 black workers were murdered; hundreds more were injured, tortured, or arrested.

The effect of this intensified phase of land

reform has been catastrophic. Commercial wheat production last year was down 52 percent from the year before, and the commercial cattle herd fell from some 1.3 million head in 1999 to below 200,000 last year. Meanwhile drought has devastated crop production in the black communal lands, which have traditionally accounted for more than half the country's maize. This year's maize production is expected to fall 70 percent short of the country's needs.

As a result more than half of Zimbabwe's 12 million people are now threatened with starvation. And as the vise of hunger has tightened, Mugabe's men have used it to their political advantage, preventing the distribution of food aid to areas associated with the opposition.

Chris Lunga is hardly the kind of man to smash houses or starve his fellow countrymen, but he is one of the beneficiaries of the land seizures. At 35, the head of a shipping agency, he was about to buy himself a small farm to run on the side when he read newspaper advertisements offering free white farms. Like thousands of other black Zimbabweans he couldn't resist the offer. Following a lengthy

application process he was allocated 120 acres, part of a farm owned by Brendon Fox, which was divided among 14 black applicants. The new settlers almost immediately began to squabble when one of them, the former governor of the province, grabbed a bigger slice than he had been allotted.

Like most white farmers Brendon Fox tried to hold on to a small piece of his land and to coexist with the new arrivals. He helped Lunga by starting to plow land for a maize crop, but before he could finish, he was thrown off by the

government. Lunga, who lives near Harare and has no farming experience himself, has hired a full-time manager and comes out to the farm on weekends.

Lunga welcomes land reform, which he sees as long overdue. "My father fought in the same war as Mr. Fox's uncle, in World War II for the British. After the war white soldiers were allowed to buy farms, but my father, because he was black, got nothing. He died a poor man.

"In any revolution, it's not fair," Lunga went on. "And it is a revolution. We are reclaiming



our land. The British pushed us out, and we're taking it back. Don't get me wrong, I don't regret the British coming. I wouldn't be talking to you in English if they hadn't, and we would have still been in the Stone Age."

Yet Lunga said the transfer of lands from whites could have been better planned. "They should be compensated for equipment, improvements. But the actual land, that's a different story. They shouldn't get compensation for the land."

He is also incensed by the food shortages in Zimbabwe, which he sees as unnecessary. "When

it comes to my stomach, I'm angry. Hungry people are angry people."

Tapfumaneyi Manzira, a systems engineer who owns a computer company, also took up the offer of free land. "I have no sympathy for the white farmers," he told me. "Maybe they did buy the farms for themselves. It's collateral damage—tough—like civilian casualties in any conflict."

But Manzira is frustrated by the way things "got out of control." He is particularly upset that neither of his neighboring plots is being actively farmed by the new black owners. "Everyone was



Plowing with hope that the government will deliver seed maize and fertilizer, a young man resettled on a white farm slices through a parched field. With scant rains and little government help, his family, already hungry, will have to turn to roots, berries, and relief food. When the government launched fast-track land reform three years ago, officials said they were confiscating white farms on behalf of landless peasants. But without the means to plant, some 200,000 poor resettled blacks are no better off than before.

caught up in the excitement. And then the reality caught up with them—that you can't just admire the land like a flower. You've got to do something with it, or stay away."

Many of the new black settlers, those who want to make the most of the land, have been waiting in vain for the seeds, fertilizer, and tractors the government has promised them. In the turmoil of the evictions, commercial farmers have usually retained title deeds to their land. Even if the government obtains ownership of this land, it is very unlikely that title will be given to the new black settlers. Without security of tenure, they cannot, like the whites before them, use land as collateral to borrow money to buy vehicles, fuel (in desperately short supply), fertilizer, and seed. Irrigation pipes have been sold for scrap, wells have fallen into disrepair, electricity has been cut off because settlers can't pay their bills. As a result many farmers have reverted to subsistence agricultural methods on what were, just a year ago, highly sophisticated, productive agribusinesses.



The brother of a farm's new owner explains to a skeptical white farmer how he will be paid for the equipment that was seized along with his property.

Avoidability is a principal element of tragedy, and Zimbabwe's farm chaos—although understandable, perhaps, in light of past injustices—was avoidable. In recent years land reform has been common cause among nearly all Zimbabweans, white as well as black, seen as a necessary measure to correct the inequality between the races.

For much of the 20th century whites possessed at least half the country's land, even though they made up no more than 5 percent of the population. This land disparity was seen as one of the main causes of the nearly eight-year war for black rule, which ended in 1980 when white-dominated Rhodesia became black-ruled Zimbabwe.

2002-2003: Mugabe loses to power after a disputed election, then forces nearly all remaining whites off their farms. Violent crackdown on the opposition.

2000: The government decides to take white farms without compensation. Government-backed squatters occupy white farms.

1997-1999: Economic crisis leads to high food prices, sparking riots and strikes in cities. Mugabe asks Britain and other donors to reinstate funding for land reform.

ZIMBABWE

1979-1980: An agreement brokered by Britain ends the war and minority rule. Resistance leader Robert Mugabe becomes prime minister of the new nation of Zimbabwe. Land reform starts. Until 1990 the government agrees to transfer land to blacks by buying farms from white sellers at market prices.

1973: Sporadic black guerrilla attacks develop into a full-scale civil war.

RHODESIA

1965: Refusing to give up minority white rule, Prime Minister Ian Smith unilaterally declares Rhodesia's independence from Britain.

1964: Malawi and Zambia become independent black-ruled states.

FEDERATION OF RHODESIA AND NYASALAND

1953-1963: Britain unites Southern Rhodesia (present-day Zimbabwe), Northern Rhodesia (Zambia), and Nyasaland (Malawi).

1930: A new law divides the colony into European- and African-occupied areas, consolidating whites' hold on the best land.

SOUTHERN RHODESIA

1923: After a vote by white settlers in 1923, the self-governing British colony of Southern Rhodesia is established.

1896-1897: The BSAC crushes uprisings by the Ndebele and Shona.

1894: Reserves are created for Africans on drier, less fertile areas as whites occupy the best land.

BRITISH SOUTH AFRICA COMPANY

1890: Politician and entrepreneur Cecil Rhodes creates the British South Africa Company (BSAC) to colonize what will become Zimbabwe. European settlers arrive in search of gold.



ROOTS OF A CRISIS

The politics of land

When land reform began in 1980 with independence, black Zimbabweans expected they would finally get their fair share of the country's farmland. But underfunded and lacking political will,

the government bought few white farms for resettlement. Then in 2000, with a deepening economic crisis and growing opposition to its rule, the government started to seize white land without payment.



Racial Breakdown 2000

Whites have represented only a tiny minority of Zimbabwe's population, but they owned 40 percent of the land as recently as 1980.



Zimbabwe 2003

Fast-track land reform—began in 2000—cut the number of white farms in full production from 4,500 to 200 early this year. Resettlement estimates, which vary widely, suggest that 200,000 or more mostly poor blacks have received confiscated land. But the sudden, often brutal change of ownership disrupted agriculture. Cash crop harvests plunged, further weakening the ailing economy.



Zimbabwe 2000

After 20 years of land reform, 75,000 black families had been resettled on 9 million acres. Yet whites still owned 28 percent of all land—and 60 percent of the best farmland. White commercial farms grew cash crops that accounted for 40 percent of Zimbabwe's exports. As the population rose—up 60 percent since the early 1980s—blacks were forced to farm on increasingly crowded, degraded communal land, and many migrated to cities where unemployment soared.

Map perspective includes 100-mile (161-kilometer) scale.
 SOURCES: COMMERCIAL FARMERS' UNION OF ZIMBABWE; LAND TENURE CENTER, UNIVERSITY OF WISCONSIN-MADISON
 2003 PROTECTED AREAS DATA: UNEP WORLD CONSERVATION MONITORING CENTRE
 NATIONAL GEOGRAPHIC

To the relief of the white farmers in particular, the newly elected leader, Robert Mugabe, made racial reconciliation a centerpiece of his policy. He appointed a white minister of agriculture and appealed to white farmers to stay on and contribute to the new Zimbabwe. Most of the whites who couldn't stomach being ruled by a black president had left the country shortly after independence, and those who remained for the most part accepted the new status quo, setting about farming with vigor in a country freed from wide-scale war. Their produce,

especially tobacco, brought in 40 percent of the country's export earnings, their crops helped feed the cities, and they employed a quarter of the country's workforce. By 1997 Zimbabwe was Africa's fastest growing economy—southern Africa's breadbasket—frequently exporting food to neighbors in need.

To achieve independence, Mugabe had agreed to a program of voluntary land redistribution, funded predominantly by Britain. Beginning in 1985 white farmers were required by law to offer the government of Zimbabwe right of



first refusal on any land that was put up for sale.

Before 1990 the government purchased, at market prices, 21 percent of the land held by whites at independence. Some of those commercial farms, however, were handed out not to landless peasants, as stipulated in aid agreements with Britain, but to Robert Mugabe's political supporters. When the extent of this practice was revealed in the local press in 1994, the British protested. Mugabe was unrepentant, and in due course most foreign funding for land purchases was frozen, and the process of land redistribution

stalled. Two decades after independence nearly four-fifths of white farmers were living on property they had bought after the government had opted not to buy the land for resettlement by blacks.

The slow pace and eventual halt of meaningful land reform failed to raise more of a spontaneous clamor from ordinary blacks—many of whom remained squeezed into overcrowded communal lands, trying to farm on leached and eroded soils—largely because of the more immediate problems of rising food prices



Jostling for position, primary school students line up for a local nutritional drink that supplements their diet of food aid. A grassroots group distributes the drink in the country's northwest, long dependent on maize and sorghum grown in more fertile regions. Because of drought and chaos on once productive commercial farms, people now pay dearly for such staples, if they can find them at all. Nationwide more than half of Zimbabweans need food aid.

and unemployment. Also by then Mugabe had achieved a virtual one-party state, and Zimbabwe was urbanizing at a furious rate. Even though 70 percent of the population still lived in rural areas, the younger generation—with the highest literacy rate in Africa—had aspirations to salaried jobs in towns rather than to a life of toiling in the fields, which has become increasingly the burden of Zimbabwe's women.

Pinned to the wall of the office of Delvillewood Farm is the high court order proclaiming that the Selby family was still its legal owner. But in reality Delvillewood Farm, in Mazowe Valley, was already occupied. Major Kanouruka of the presidential guard had taken over the front half, and Molly Mapfumo, a local official, had taken the back. After a four-month tug-of-war in which the farm had been shut down no fewer than nine times, the Selbys were losing heart. Mick Selby, who farmed here with his father, Jeremy, had had his

house broken into and occupied two months earlier by Major Kanouruka and his young toughs—graduates of a notorious militia training camp.

As I talked to Mick and his mother, Janet, the new overlords were in evidence. One of the youths had a half-full beer bottle sloshing in his pocket; another, tall and somewhat tipsy, danced around throwing kung fu punches.

"Zimbabwe for Zimbabweans," they chanted.

"I was born here, I'm Zimbabwean too," Mick rebutted in Shona—the language spoken by most blacks here—but the major's enforcers weren't listening.

The Selbys had come back to supervise a squadron of combine harvesters churning through their winter wheat crop. That they were allowed to plant the wheat at all was due to a deal they struck to share their land with Major Kanouruka. The Selbys agreed to prepare, plow, plant, fertilize, and harvest a similar field of wheat for him. He agreed to pay his share of the



Out of Work Blacks who once worked on a white-owned farm live in tents and cook donated food near Epworth. About 250,000 farmworkers have lost their jobs. Few, if any, have been resettled under Mugabe's land reform program, which focuses on blacks in communal areas.



New Boss Laying claim to land he says colonists stole from his ancestors, businessman Tapfumaneyi Manzira inspects a fledgling paprika crop on his part of a farm the government divided among better-off blacks. Manzira says land reform is justice: "We are rectifying history."

costs and reap his share of the profit. Of the latter the Selbys had no doubt; of the former they had no hope. The major had already forced the closure of their bakery, which supplied 15,000 people in the area, as well as their butchery and trading store.

After the winter wheat came in, there would be virtually no more activity on the farm, and the hundred workers would be out of jobs. The 45 acres of citrus trees were wilting and would soon die—the irrigation piping on which their health depended had been dug up and sold by the major's men. The greenhouses where the Selbys grew roses for export to the Netherlands were nothing now but a torn skin of plastic, flapping in the breeze against the exposed skeletons of wooden struts. The swimming pool was dark with rotting leaves; the clay tennis court had sprouted a quiff of elephant grass. Delvillewood Farm was rapidly returning to the bush.

To early white visitors the African bush seemed almost empty: Mostly an "unpeopled country," said an explorer in 1871. Casting his eyes across the wilderness, he mused, "Fancy a church spire rising where

that tamarind rears its dark crown of foliage, and think how well a score or so of pretty cottages would look instead of those thorn clumps and gum trees!"

This impression of emptiness was accentuated by the Africans' slash-and-burn agriculture. The land was cleared by fire, and crops were planted by hand, with rain relied upon to water them. When the soil became exhausted after two or three seasons, the farmer moved on to a new patch of bush. The Western idea of land ownership was alien. One white farmer tells of his grandfather going to see a local chief about buying some land many years ago. "Buy land?" said the chief. "You must be crazy—you don't buy the wind or the water or the trees."

When, in 1890, the first white pioneers—emissaries of Cecil Rhodes's British South Africa Company (BSAC)—trekked up from South Africa, they came to prospect for gold. The BSAC struck a deal with Lobengula, king of the Ndebele—a deal that dwelt exclusively on mineral rights. But El Dorado this proved not to be.

Soon the white pioneers clashed with and defeated Lobengula's warriors, and Rhodes granted 700 white men large tracts of land in a



Era's End En route to what remains of her family's land, Tara Alford looks out on acres of sugarcane on a neighbor's farm mostly resettled by the government. Across southern Africa whites face losses as the region confronts land reform and its own colonial past.

country where the African population numbered perhaps 900,000. Subsequent whites obtained their land from the BSAC, but tribal authorities were never compensated.

In 1896 first the Ndebele and then the Shona tribes rebelled in a *chimurenga*, or war, against white occupation. Thousands of blacks and nearly 400 whites were killed in an 18-month revolt, which failed, leaving much of the land in white hands.

As white rule was established, and modern medicine introduced, the population in the reserves—the mostly drier, less fertile areas into which rural blacks were confined—increased. By 1950 blacks in what was then Southern Rhodesia numbered two million, and white immigrants were being recruited from Europe to buy farms with low-interest loans.

When the hard-line white conservative party of Ian Smith came to power in 1962, the stage was set for collision. Aiming to prevent black rule, in 1965 Smith declared unilateral independence from Britain. By 1972 black opposition to white rule had boiled over into civil war—the second *chimurenga*, as the nationalist guerrillas called it. Perhaps 30,000 blacks died in the fighting,

many of them civilians; on the white side, just as in the first *chimurenga*, it was the farmers who found themselves on the front line. Guerrillas killed more than 1,500 whites by the time the guns were stilled in 1980.

Twenty-two years after the war, in the thick of Mugabe's fast-track land reform program, you might have believed it had never ended. Every night the main news bulletin on Zimbabwe's state-controlled TV was interspersed with commercials extolling the land-seizure program. "*Chave chimurenga—Now it's war,*" the jingle went.

Although white farm owners have been the principal target of Mugabe's land campaign, it is the black farmworkers and their families who have become its main victims. So far 1.2 million of them have been displaced. Bigson Gumbeze is a project manager for displaced farmworkers at the Zimbabwe Community Development Trust, a private organization devoted to aiding workers affected by the land reform program.

One morning Gumbeze and I drove east out of Harare with a delivery of donated clothes. At the balancing granite boulders of Epworth, the

hard-top road narrowed then ran out altogether until we came to Rock Haven refugee camp, an expanse of olive tents where about 200 farmworkers had been living for the past six months. The refugees sat, mostly barefoot and ragged, under a grove of msasa trees as Gumbeze and his assistants doled out their bounty. Most of the refugees were workers from one farm, Chipesa, owned by Iain Kay. He had openly campaigned for the opposition party in the disputed 2002 general election that returned Mugabe to power—and paid the price with his farm.

“One day,” said James Sani, one of the Chipesa refugees, “the war vets and party youth arrived on our farm and said it belonged to them now. They put a gun to Iain Kay. The vets beat us with iron bars and axes, and they looted our property and chased us away.”

Another Chipesa worker, Armando Serima, who had come to Zimbabwe from Mozambique as a small boy, spoke up. “They called us *muveni*, enemy, because they said we supported the opposition party. We hid in the bush eating roots and leaves and begging food from other farmworkers at night, until Mr. Kay came and found us hiding there in the mountains just when we were about to die of hunger, and he brought us here.”

“So we have nothing,” Sani added. “I was born at the farm, grew up at the farm, went to school on the farm, worked for the past eight years on the farm. My father died on the farm. All we know is farming. That’s what we want to do again.”

It seems a vain hope. The devastation to Zimbabwe’s agriculture is most apparent from the air. As I circled over some of the country’s prime land, I saw not freshly tilled land planted for the new season but empty fields devoid of activity. “It’s nothing less than the wholesale dismantling of the agricultural sector, the backbone of the entire economy,” said John Makumbe. A professor of political science

at the University of Zimbabwe, Makumbe is also the national chairman of Transparency International, a global organization that fights corruption. “Agrarian reform has to be holistic. You

don’t just allocate land; you must put infrastructure in place, financial support, training. None of that was done. So both in the medium and long term we are looking at a crippled agricultural sector in Zimbabwe.”

And a crippled financial system as well. “White farmers, because they weren’t compensated, have walked away from their farms owing millions of dollars to the banks. At least two banks have already collapsed, and the rest are teetering on the brink. We’re in a new situation,” said Makumbe.

Parts of Africa have expressed support for Zimbabwe’s transformation, seen as the righting of historic wrongs. In Namibia, President Sam Nujoma has his eye on the large white ranches that make up a disproportionate part of his country’s agricultural land. Following Zimbabwe’s example, Nujoma has threatened to replace the country’s current willing-seller land redistribution program with one of forced transfers. South Africa, the regional powerhouse, is itself struggling with land reform, and President Thabo Mbeki, through his inaction, has given tacit approval to Mugabe’s land revolution. South Africa’s original goal was to redistribute 30 percent of white-owned land to landless blacks by 1999. But so far less than 5 percent has been transferred, and the target date has been pushed back to 2015.

There are also African voices raised against what has been happening in Zimbabwe. Wole Soyinka, the Nobel Prize-winning Nigerian writer, compares the Zimbabwean land program with Stalin’s land collectivization in the Soviet Union, designed to get rid of the kulaks, the prerevolutionary farmers whom Stalin saw as a political threat. And Archbishop Desmond Tutu, another Nobel laureate, has characterized Mugabe’s presidency as “almost a caricature of all the things people think black African leaders do. He seems to be wanting to make a cartoon of himself.”

There may not be agreement within Zimbabwe and across Africa about the land transfer program, but no one disputes that Zimbabwe’s century-old system of large-scale commercial farms, some of the most productive in Africa, is gone. And it seems clear that the chaotic, violent manner of its passing will scar the country—and perhaps keep it hungry—for years to come. □

WEBSITE EXCLUSIVE

Videotake: Photographer Gideon Mendel shares tense moments working in Zimbabwe. Forum: Post your thoughts on land redistribution. Both at nationalgeographic.com/ngm/0308.

ZipUSA

PITTSBURGH, PENNSYLVANIA





15222

Come Hungry

BY RAPHAEL KADUSHIN
PHOTOGRAPHS BY DAVID McLAIN

Yes, the fries — & coleslaw
are inside Primanti's cheese-
steak sandwich, a staple
in Steeltown's Strip.

PITTSBURGH, PENNSYLVANIA



15222

Pittsburgh
Harrisburg*

AREA:

22 city blocks

RESTAURANTS: 35

PENNSYLVANIA

MACARONI CO.'S CHEESE

SALES: 8,000 pounds

a week

PRIMANTI SANDWICHES

SERVED WEEKLY: 6,000

CALORIES IN A PRIMANTI

CHEESESTEAK: About

1,000

NUMBER OF PEOPLE WHO

CARE: Zero

Early one morning at Primanti Brothers, in the middle of Pittsburgh's Strip District, Antonia Corradetti is constructing a sandwich so big it would make Dagwood blanch. A fixture behind the long diner counter, she flips a wad of just grilled corned beef onto a thick slice of Italian bread. Then, yanking a basket of oil-dripping french fries directly from the deep fryer, she plunges her bare hand into the heap, extracts a fistful of steaming potatoes, and smashes them on top of the beef, so you can hear the sizzle when the smoking spuds greet the meat. Surprised there is no echoing sizzle coming from Corradetti's hand, I'm ready to dial 911, but she seems indifferent to her five-finger fire walk.

"I've only been doing this for 28 years," she says with a shrug, in a strong Italian accent. "I can do a thousand of these an hour." But the pain? "Well the first time I did it, it was kinda hot, but the grill is a good conditioner." Corradetti laughs, holding out beautifully manicured hands as soft as a baby's cheek.

Locals call Corradetti's literal handiwork the official Strip sandwich—not just because others have copied it but because it mirrors the district's own history. Dating back to 1933, when the Strip was still the exclusive turf of wholesalers delivering produce out of mammoth brick warehouses, the sandwich was aimed at a fail-proof market. For the truckers who were Strip royalty, nothing tasted better than the meat-and-potatoes meal they could hold in one big hand, while they steered with the other.

Now the sandwich is consumed mostly by late-night clubbers, but it



When dusk falls, the Strip transforms from daytime food emporium into all-night playground. As cafés and clubs come alive, revelers vie for parking and bar space. A 3 a.m. crowd packs Primanti Brothers (above), where muscular sandwiches are served 24-7.

TO MAKE PRESCRIPTION DRUGS AFFORDABLE:



Fig. 1

Arrange a meeting
with Congress.



Fig. 2

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affordable prescription
drug benefit in Medicare.



Fig. 3

Relax.

still signifies the way the Strip guards its traditions, starting with its own defining look. Forget designer makeovers. You can see Pittsburgh's high-rises in the near distance, just to the south, but the restless development largely stops at the Strip's border, where the hulking brick buildings still throw long shadows like something out of a Hopper painting.

The district's survival, though, was never a sure thing. It underwent a slow decline that began in the Depression, when the warehouses first started to lose business. But by the 1970s the wholesalers were opening retail shops, and by the '90s a fresh generation of style setters had moved in, launching the boutiques, galleries, and dance clubs now lining Penn Avenue, the Strip's version of Main Street. The inevitable conversion of warehouses into lofts followed, and the Strip morphed from homey to high style.

Now the neighborhood maintains a delicate balancing act between old and new, one that plays 24 hours a day. I fuel my 24 with a fresh-brewed cappuccino at La Prima, surrounded by shop owners swapping gossip and rustling Italian newspapers. At 10 a.m. I'm mingling with the crowds at the Pennsylvania Macaroni Company, where the standard blocks of mozzarella have been joined by French Brie, English Stilton, and Danish blue, though the clerks still slice the cheese with attitude ("What you want, hon?"). Serious eaters usually follow with a wedge of *torta rustica* at Il Piccolo Forno. "I bake every night from 11 p.m. to 7 a.m.," Antonio Branduzzi says, as he bags an almond popover for me, "but it's worth it. I came here from Lucca, Italy, 17 years ago, and I felt right at home. Maybe because a lot of Lucca was already here."

Down at Parma Sausage, another obligatory morning pit stop, owner Luigi Spinabelli also feels at home, despite his own bumpier transition when he came over from Italy in 1954. "Everything you touched in Pittsburgh then turned you black it was so dirty," he says, "and every time a streetcar passed by, the salami we smoked in our living room would swing, so we thought the whole building would fall down."

Today the meat sits out in Parma Sausage's long jewel box of a deli case, overseen by Luigi's daughter, Rina. She always knew she'd be part of the



"The senses, the ability to enjoy taste and texture are gifts that God gives us."

—TOM JOHNSON



Bone-licking ribs attract soul-food fans on Saturdays, when ethnic food stalls and street vendors jam the Strip. "That's when everybody ■ Pittsburgh comes together," says the Reverend Tom Johnson (above). "It's a pilgrimage." A welder downs a crunchy lunch at Triangle Welding, a thriving business true to the area's blue-collar roots.

“The clams were the only ones
that benefited from my arthritis.

Sorry guys, I’m back.”



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People with allergic reactions, such as asthma, to aspirin or other arthritis medicines should not take VIOXX. In rare cases, serious stomach problems, such as bleeding, can occur without warning.

Tell your doctor if you have liver or kidney disease, or a history of angina, heart attack, or a blocked artery in your heart. VIOXX cannot take the place of aspirin for the prevention of heart attack or stroke. VIOXX should not be used by women in late pregnancy.

VIOXX has been extensively studied in large clinical trials. Commonly reported side effects included upper respiratory infection, diarrhea, nausea, and high blood pressure. Report any unusual symptoms to your doctor.

Please see the Patient Product Information for VIOXX on the next page for additional information that should be discussed with your doctor.

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Patient Information about
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VIOXX® (pronounced "VI-ox")
for Osteoarthritis, Rheumatoid Arthritis and Pain
Generic name: rofecoxib ("ro-fa-COX-ib")

9183907

You should read this information before you start taking VIOXX®. Also, read the leaflet each time you refill your prescription, in case any information has changed. This leaflet provides only a summary of certain information about VIOXX. Your doctor or pharmacist can give you an additional leaflet that is written for health professionals that contains more complete information. This leaflet does not take the place of careful discussions with your doctor. You and your doctor should discuss VIOXX when you start taking your medicine and at regular checkups.

What is VIOXX?

VIOXX is a nonsteroidal anti-inflammatory drug (NSAID) that is used to reduce pain and inflammation (swelling and soreness). VIOXX is available as a tablet or a liquid that you take by mouth.

VIOXX is a medicine for:

- relief of osteoarthritis (the arthritis caused by age-related "wear and tear" on bones and joints)
- relief of rheumatoid arthritis in adults
- management of acute pain in adults (like the short-term pain you can get after a dental or surgical operation)
- treatment of menstrual pain (pain during women's monthly periods).

Who should not take VIOXX?

Do not take VIOXX if you:

- have had an allergic reaction such as asthma attacks, hives, or swelling of the throat and face to aspirin or other NSAIDs (for example, ibuprofen and naproxen)
- have had an allergic reaction to rofecoxib, which is the active ingredient of VIOXX, or to any of its inactive ingredients. (See Inactive Ingredients at the end of this leaflet.)

What should I tell my doctor before and during treatment with VIOXX?

Tell your doctor if you are:

- pregnant or plan to become pregnant. VIOXX should not be used in late pregnancy because it may harm the fetus.
- breast-feeding or plan to breast-feed. It is not known whether VIOXX is passed through to human breast milk and what its effects could be on a nursing child.

Tell your doctor if you have:

- history of angina, heart attack or a blocked artery in your heart
- kidney disease
- liver disease
- heart failure
- high blood pressure
- had an allergic reaction to aspirin or other NSAIDs
- had a serious stomach problem in the past.

Tell your doctor about:

- any other medical problems or allergies you have now or have had
- all medicines that you are taking or plan to take, even those you can get without a prescription.

Tell your doctor if you develop:

- serious stomach problems such as ulcer or bleeding symptoms (for instance, stomach burning or black stools, which are signs of possible stomach bleeding).
- unexplained weight gain or swelling of the feet and/or legs
- skin rash or allergic reactions. If you have a severe allergic reaction, get medical help right away.

How should I take VIOXX?

VIOXX should be taken once a day. Your doctor will decide what dose of VIOXX you should take and how long you should take it. You may take VIOXX with or without food.

Can I take VIOXX with other medicines?

Tell your doctor about all of the other medicines you are taking or plan to take while you are on VIOXX, even other medicines that you can get without a prescription. Your doctor may want to check that your medicines are working properly together if you are taking other medicines such as:

- warfarin (a blood thinner)
- theophylline (a medicine used to treat asthma)
- rifampin (an antibiotic)
- ACE inhibitors (medicines used for high blood pressure and heart failure)
- lithium (a medicine used to treat a certain type of depression)

VIOXX cannot take the place of aspirin for prevention of heart attack or stroke. If you are currently taking aspirin for this purpose, you should not discontinue taking aspirin without consulting your doctor.

What are the possible side effects of VIOXX?

Serious but rare side effects that have been reported in patients taking VIOXX and/or related medicines have included:

- Serious stomach problems, such as stomach and intestinal bleeding, can occur with or without warning symptoms. These problems, if severe, could lead to hospitalization or death. Although this happens rarely, you should watch for signs that you may have this serious side effect and tell your doctor right away.
- Heart attacks and similar serious events have been reported in patients taking VIOXX.
- Serious allergic reactions including swelling of the face, lips, tongue, and/or throat which may cause difficulty breathing or swallowing and wheezing occur rarely but may require treatment right away. Severe skin reactions have also been reported.
- Serious kidney problems occur rarely, including acute kidney failure and worsening of chronic kidney failure.
- Severe liver problems, including hepatitis, jaundice and liver failure, occur rarely in patients taking NSAIDs, including VIOXX. Tell your doctor if you develop symptoms of liver problems. These include nausea, tiredness, itching, tenderness in the right upper abdomen, and flu-like symptoms.

In addition, the following side effects have been reported: anxiety, blurred vision, colitis, confusion, decreased levels of sodium in the blood, depression, fluid in the lungs, hair loss, hallucinations, increased levels of potassium in the blood, insomnia, low blood cell counts, menstrual disorder, palpitations, pancreatitis, severe increase in blood pressure, tingling sensation, unusual headache with stiff neck (aseptic meningitis), vertigo.

More common, but less serious side effects reported with VIOXX have included the following:

Upper and/or lower respiratory infection and/or inflammation
Headache
Dizziness
Diarrhea
Nausea and/or vomiting
Heartburn, stomach pain and upset
Swelling of the legs and/or feet
High blood pressure
Back pain
Tiredness
Urinary tract infection.

These side effects were reported in at least 2% of osteoarthritis patients receiving daily doses of VIOXX 12.5 mg to 25 mg in clinical studies.

The side effects described above do not include all of the side effects reported with VIOXX. Do not rely on this leaflet alone for information about side effects. Your doctor or pharmacist can discuss with you a more complete list of side effects. Any time you have a medical problem you think may be related to VIOXX, talk to your doctor.

What else can I do to help manage my arthritis pain?

Talk to your doctor about:

- Exercise
- Controlling your weight
- Hot and cold treatments
- Using support devices.

What else should I know about VIOXX?

This leaflet provides a summary of certain information about VIOXX. If you have any questions or concerns about VIOXX, osteoarthritis, rheumatoid arthritis or pain, talk to your health professional. Your pharmacist can give you an additional leaflet that is written for health professionals.

Do not share VIOXX with anyone else: it was prescribed only for you. It should be taken only for the condition for which it was prescribed.

Keep VIOXX and all medicines out of the reach of children.

Inactive ingredients:

Oral suspension: citric acid (monohydrate), sodium citrate (dihydrate), sorbitol solution, strawberry flavor, xanthan gum, sodium methylparaben, sodium propylparaben.

Tablets: croscarmellose sodium, hydroxypropyl cellulose, lactose, magnesium stearate, microcrystalline cellulose, and yellow ferric oxide.

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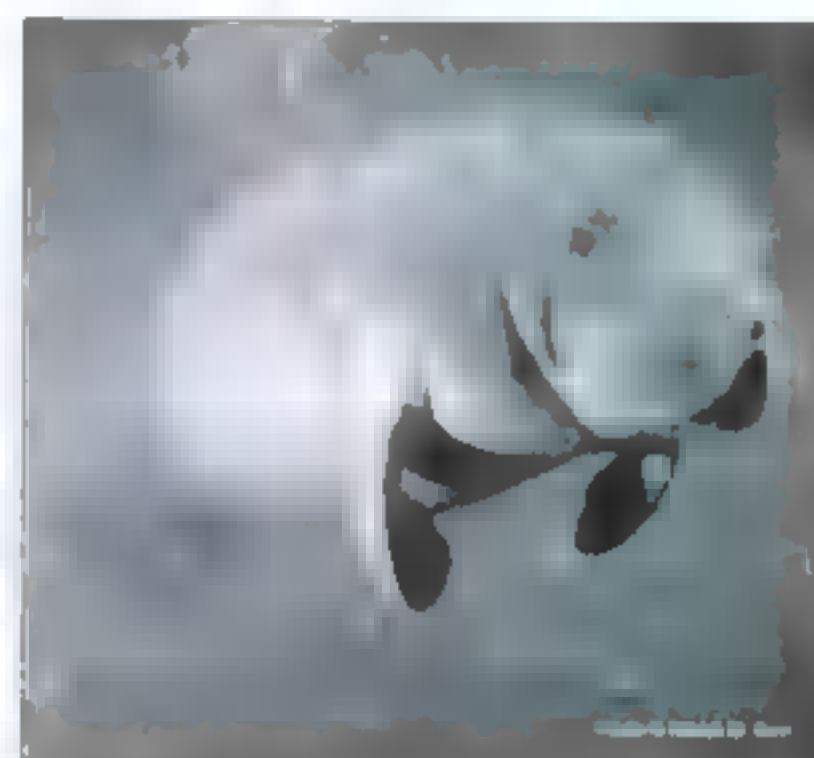
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family business. “When my parents brought me back from the hospital, the first thing they did was hang a lovely mobile of big salamis above my crib,” Rina says with a laugh.

Many morning shoppers in the Strip have their own visceral memories. A few blocks from Parma, at St. Stanislaus Kostka Church, the older Polish worshipers recall the day in 1935 when the banana warehouse—still sitting sheepishly across the street—suddenly exploded, fracturing the chapel’s turrets. “It can be dangerous,” Father McKenna muses, “to use gas when you’re ripening fruit.”

Around the corner on Penn Avenue, at Klavon’s Ice Cream Parlor, owner Ray Klavon relives another neighborhood trauma. “My father was trapped on top of the parlor phone booth for an entire night during the 1936 flood,” he says. “He was finally hauled through the window into a rowboat, and he wasn’t a small man.”

By afternoon nostalgia wanes, and Tuscan hill town gives way to global village, as young urbanites start to prowl the boutiques. “The people who want the best coffee and cheese are also the kind of people who want the best decorative objects,” Keneva Fecko, co-owner of Hot Haute Hot, says, pointing to a shelf of scented candles. “Hollywood,” she assures me, “is all over these.”

The Strip’s fusion act comes fully to life at night, when casual eateries like Primanti and chic restaurants like Lidia’s fill up and the pierced kids outside the Rosebud dance club compare tattoos with the last of the Strip’s truckers.

For Lucy Sheets, a Vietnamese immigrant, the spectacle is worth her own epic hours. “I never miss one night,” she says, flipping the chicken kabobs she cooks on a sidewalk grill. “Last night I was grilling until 4 a.m.” As she places a new skewer on the heat, we watch the crowds: the Prada brigade bursting out of a sushi bar, a warehouse workman hauling a crate of fruit, and what looks like Antonio heading to the bakery. It’s midnight, and I’m ready to end my own day early, but Sheets is still wide-awake and cooking. “I return to Vietnam for a few months every winter,” she says.

But every spring she’s back to catch the show. □



“We’re saving the world . . . one biscotti at a time.”

—LARRY LAGATTUTA

Sounds of Sinatra lure patrons into a lindy hop while they wait at Enrico’s Biscotti Co., where bakers make 1,200 pounds of the headliner cookies every day. “We cook, talk, dance, drink,” says owner Larry Lagattuta (above). “Sometimes pandemonium breaks out.”

WEBSITE EXCLUSIVE

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Final Edit



ATACAMA DESERT

Home Stretch

Viscacha on the rocks: Just what photographer Joel Sartore needed. He snapped about 400 pictures of this mother and baby viscacha—a relative of the chinchilla—in Chile's Atacama Desert. "I've been known to shoot 20 or 30 rolls of one subject," Sartore says. "There's a lot of time between good photographic opportunities, so when you get one, you tend to smother it." In this case only two frames caught the baby in full stretch. This particular image was Joel's favorite, but ultimately a portrait of a lone adult was chosen for the article. "The animal on page 66 was lighter than the background and popped out," says illustrations editor Dennis Dimick. "And its illumination and simple composition made the image work at a small size."

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WORLDWIDE ADVENTURE

Trial by Jungle

Three months on the Amazon weight-loss plan

Looking back, writer **Scott Wallace** laughs when he thinks about his preparations for his trip through the Amazon. "I'd already been going to the gym a lot," he says, "but nothing in my life prepared me for the deprivation and physical exertion—three months in the wilderness."

Scott (below, with expedition leader Sydney Possuelo) and photographer **Nicolas Reynard** (left, standing on a 60-foot-long dugout canoe on the Foz de Iguaçu River) and I were the only ones who didn't have to learn about an uncontacted tribe in the Yucatán. The tribe had been known for years, but their location was widely disputed.

on what we could hunt or fish," says Scott, "so the fare was—let's call it meager, usually tough monkey meat in stinky broth. I lost 30 pounds on the trip."

One day Scott's feet went out from under him while following the team's bushwhacking scouts. As he fell, a razor-sharp sapling, hacked off by the machete-wielding scouts, tore through his shirt and nearly impaled him. "After that," he says, "I decided I could handle the hunger. I just wanted to avoid serious injury."

—if he'd been badly injured. The nearest helicopter landing strip was 100 miles away. It took a long time to get the supplies, and it would have taken four or five days to get to a town.



ALASKA COAST

Survival of the Fitted

The hazards of working in Alaska

The survival suit may look a little large on photographer **Susie Post Rust**, but passengers on the Alaska Maritime National Wildlife Refuge's research vessel *Tiglaç* have to learn how to put one on in case they're plunged into the Bering Sea's 40°F waters. "With it, you're supposed to survive up to 24 hours," Susie reports. "Without it, you probably wouldn't last an hour."

There were dangers above the Bering too. Twice the engine on the small plane from which she



MO-SAITU

shot aerial views stalled in mid-air. "The plane goes silent, you know the water is icy, and the impact would kill you anyway. The second time it happened, I said, OK, that's it, I'm done."

To be available to shoot in the

summer, when most wildlife researchers work, Susie had to move her wedding date from June to May. But her fiancé, Adam Rust, took it in stride: He'd been to Alaska with her, and knew why its beauty was drawing her back.

WORLDWIDE

"The closing picture in the Zimbabwe story was taken from the back of this truck," explains photographer **Gideon Mendel** (below). It belongs to the Alford family, who had been evicted from their land but were commuting with their laborers to help farm it. Today they again live on

part of it. Gideon grew up in South Africa in "a family opposed to apartheid, and I went into photography as a tool to show what was happening." Work has taken him to neighboring Zimbabwe eight times since 1992. "It used to be such an open, receptive place to photograph," he says. "It's

upsetting now to see the fear, the anger, the frustration."

Writer **Raphael Kadushin** insists he gained no weight while reporting on the food and fun in Pittsburgh's Strip District. "I'm a contributing editor to *Bon Appétit*, so I'm used to sampling food," he says. "You do what wine tasters do—you sample small portions." In an ice cream parlor that had once been a pharmacy he found that some of the old remedies were still on hand in the original boxes. One was an anti-anxiety medication called Sedative #2, whose main ingredient was cannabis. (No samples were tested.)



SALLY ALFORD

WEBSITE EXCLUSIVE

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If You Purchased the Drug Cardizem[®] CD or any of its AB3-Rated Generic Equivalents From January 1, 1998 through January 29, 2003

You May be Entitled to a Recovery

This notice is to inform you of the proposed settlement of a lawsuit brought by the Attorneys General of the 50 States, Puerto Rico and the District of Columbia under which you may be entitled to make a claim for a recovery for your purchases of the brand name drug Cardizem[®] CD or its AB3-rated generic equivalents.

What is the Lawsuit About?

The Attorneys General have alleged that certain Defendants violated the antitrust laws and, as a result, consumers were overcharged for their purchases of Cardizem[®] CD or any of its AB3-rated generic equivalents. Defendants have denied any wrongdoing or liability.

What are the Terms of the Settlement?

Under the proposed Settlement, approximately \$21,000,000.00 will be set aside to pay consumers related to purchases of the drugs.

Who Can Benefit from the Settlement?

If you are a consumer who purchased Cardizem[®] CD or any of its AB3-rated generic equivalents from January 1, 1998 through January 29, 2003 ("Relevant Period"), you are a member of the Settlement Class and can file a claim for a recovery. If you had a prescription for Cardizem[®] CD from your physician, an AB3-rated generic equivalent product is one that can be legally substituted for Cardizem[®] CD by your pharmacist.

What are My Legal Rights?

If you wish to remain a member of the Settlement Class, you do not need to take any action to remain a member. However, to share in the Settlement Fund you must file a claim as discussed below. If the Court approves the proposed Settlement, you will be bound by all orders of the Court and any legal claims you may have against the Defendants relating to the conduct alleged in the lawsuit will be released.

If you do not wish to remain a member of the Settlement Class, you must mail a written request for exclusion, postmarked by September 22, 2003, to the Cardizem[®] CD Consumer Settlement Administrator at the address below.

How Can a Claim be Filed?

If you remain a member of the Settlement Class and you wish to submit a claim against the settlement fund, you must submit your claim by September 23, 2003, to the Cardizem[®] CD Consumer Settlement Administrator. A claim can be registered by visiting the www.cardizemsettlement.com website, calling the toll-free number below, or writing the Settlement Administrator at the address listed below.

The Court will hold a final approval hearing on the proposed Settlement on October 1, 2003 at 11:00 a.m. Eastern Time in the Courtroom of the Honorable Nancy G. Edmunds, at the U.S. District Court, Eastern District of Michigan, 231 W. Lafayette Boulevard, Detroit, Michigan 48226.

**For Complete Information, a Copy of the Notice of
Proposed Settlement, and to Register a Claim:**

Call: 1-800-372-2406

or Visit: www.cardizemsettlement.com

**Or Write: Cardizem[®] CD Consumer Settlement Administrator,
P.O. Box 1675, Faribault, MN 55021-1675**

Flashback



H. C. ELLIS

MARAIS

Hell's Swells

A hot spot called Hell's Café lured 19th-century Parisians to the city's Montmartre neighborhood—like the Marais, on the Right Bank of the Seine. With plaster lost souls writhing on its walls and a bug-eyed devil's head for a front door, le Café de l'Enfer may have been one of the world's first theme restaurants. According to one 1899 visitor, the café's doorman—in a Satan suit—welcomed diners with the greeting, "Enter and be damned!" Hell's waiters also dressed as devils. An order for three black coffees spiked with cognac was shrieked back to the kitchen as: "Three seething bumpers of molten sins, with a dash of brimstone intensifier!"

Redemption for Hell's patrons wasn't far away: A café called Heaven was right next door.

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